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PERSONAL RELATIONS

A SUBSTANTIAL part of a highly interesting speech by Sir Edgar Sylvester as principal guest at the Coal Industry Society's luncheon in London last week was devoted to the important question of personal relations—peculiarly a problem of our times and one which affects everyone responsible for the running of an industry on a large scale, whether nationalised or not. Sir Edgar was speaking as Chairman of the Gas Council, and his comments on this matter affect all in the gas industry. He remarked that in the old days, before the growth of industries into extensive and far-reaching organisations, an employer often knew every person employed in his business by sight and by name, and every man in the business knew his employer. Today in the majority of our important industries that relationship has changed. In place of the old 'family business' there are large impersonal concerns in which the employer is so far removed from the man on the job that there is to all intents and purposes no effective contact between them. Sir Edgar went on to say that there is a danger here, where the source of control is regarded as a remote and almost intangible being, approximating almost to what Shelley called 'the awful shadow of some unseen Power,' that a man's interest in his work and loyalty to his employer will dwindle into fatalism and indifference or even become distorted and changed to a feeling of hostility.

It is obviously impossible for the chairman of an area gas board to take the place of the chairman of each undertaking, and there is the risk not only that satisfaction in individual responsibility and pride in local achievement may be endangered, but that control may be regarded as a remote and unfeeling entity which can only be described by the vague appellation of 'they.' 'I think,' said Sir Edgar, 'we must all admit that so far no complete solution to this problem has been found. But surely it is clear that either some kind of personal relation must be substituted for the old one or men must be content to realise that the march of events has removed the old idea of personal contacts. My own very strong feeling is that everything possible should be done to find a way of maintaining the personal contact between those in control and those actually on the job. And, as I see it, the only possible approach to the problem is to ensure that the working units should be on such a scale (taking into account numbers and geography) that a manager is not a vaguely realised individual far removed from the workers under his charge, but a man in close relationship with them.'

Sir Edgar added that it is impossible for such a manager to take the place of his opposite number in the old regime unless, within the framework of a general policy, he is given full authority and receives full backing from his board in dealing with his men. Central control, in short, must not close the door on local responsibility, but must keep it open. This inevitably means that local managers must have a pretty wide field in which they can enjoy unrestricted action without reference to their superior controlling bodies. It also implies—and this is equally important—that it must be made quite clear to the men under such a manager's command that he has, in fact, got the necessary authority and prestige. It is only in this way that the growing gulf between the controlling body and the worker can be bridged.

THE SERVICE ANGLE

JANUARY is traditionally the month for new resolutions, which are highly personal things. While lacking the temerity to suggest new leaves suitable for turning over, we nevertheless hope that some of the following comments will provide inspiration. We are thinking particularly of sales and service. Is it not time that some appraisal was made of the industry's selling machinery? Machinery can wear out, become obsolete, or ruined through lack of attention, and its deterioration in efficiency can be so gradual as to escape the notice of those in control. A searching self-analysis would not come amiss, and a peep over the fence at our competitors. Consider, therefore, some of our gears and bearings, estimate our motive force, check our fuel and lubrication, and keep a wary eye open for sand in the cogs.

Our family motto and battle cry is, surely, service to the consumer. Is there such a thing any more? We may be forgiven for expressing doubt; a poll conducted by one national daily has revealed that readers' personal experiences of State ownership place the nationalised gas

service as one of the chief targets for abuse, and the electricity boards as one of the chief subjects of praise. Does anyone care—or are we too drugged with past successes? Our laboratories and works may be hives of industry, our chemists and engineers may win fresh victories daily, but is the public aware of it? How can it be unless this progress is discernible at the last link in the chain, where industry and consumer meet? There is still insufficient recognition of the fact that the consumer judges the gas industry only by its showrooms, salesmen, appliances, and service, and that the only occasions on which the man in the street considers the rest of the industry is when the price of gas goes up or the wind blows from the local gasworks.

The pros and cons of showroom design have been debated on many occasions. We have no intention of entering the ring at this juncture, save to point out that Mr. Everyman's opinion of the gas industry is greatly influenced by his local showroom. It might be chromium plated and spotless, or depressing and grubby; it might scare him to death or arouse his contempt; it might be friendly inside or cold and off-hand. But the impression, whatever it may be, will be a potent influence. Our showrooms vary too much. They must be improved, made more uniform, and equipped with adequate displays.

The salesman, alas, has had little enough incentive in recent years. Too many managers have been firm adherents to the 'profits made in the retort house' school of thought and have looked with disapproval on the salesman's equality of status with his engineering colleagues. If he wanted to improve himself, they said, let him take a course. But they made no promises about his reward if he passed successfully. In too many cases salaries were not—and are not—calculated to attract the right type of man. Today, despite the oft-repeated warning of fiercer competition (which seem to have induced a lulling effect), little is being done. Among themselves the salesmen are ripe for encouragement. That much is clear from the changed tenor of their Circle meetings, a review of which appears elsewhere in this issue. Some area boards have promised them definite action, and it is to be hoped that their expectations are realised; other boards do not appear to have got far enough through their agenda to consider the matter. And while on the subject of personnel, it must not be forgotten that the consumer is influenced by the appearance, demeanour, and efficiency of the gas-fitter. Fitters going about their business through the streets should look like craftsmen, however humble, not like displaced persons, and should not confide to their clients the shortcomings of their undertaking and immediate superiors. These things happen, but we are not blaming the fitters; they must be trained, helped, and rewarded, if things are to improve.

Lastly, we venture some comments on gas appliances. From the standpoint of efficiency, there is probably no other industry boasting apparatus of such uniformly high efficiency. It must be admitted, however, that during recent years both electrical and solid fuel appliances have progressed more rapidly than our own. The ratio of gas to electric cookers must be maintained, but the electric cooker is now an infinitely more formidable opponent than it was years ago. The same applies to the electric water heater. We have the advantage of a superlative system of appliance testing which effectively limits the expansion of undesirable equipment, while the electricity industry has no means of checking the many cheap and dangerous appliances which flourish in most electrical dealers premises. Our competitors are well aware of their weakness in this respect, and we have reason to believe that steps are being taken in an attempt to exercise greater control. There is, too, the question of appearance to consider, which plays no small part in influencing customers—this applies particularly to space heaters. In our view, a comparison of the best examples of space heaters, of both fuels, leads one to favour the electrical appliances. The fact that the gas-operated equipment may be more efficient or less expensive does not carry as much weight with customers as some suppose

RETROSPECT

'THE moment is not without some solemnity. The present number marks the end of the first half of the 20th Century, a century which will go down in history as that of the automobile, aviation, radio and nuclear energy.' Such is the opening sentence of the *Journal des Usines à Gaz* of December 15, 1949. The Editor goes on to turn over his back pages from 1899 to discover what were the preoccupations of the industry at that distant date. All minds were turned towards the preparation of the Exposition Universelle (the Paris Exhibition) of 1900. Here the Pavilion du Gaz made a brave show, very old fashioned to our 1949 eyes, with its dome and its conspicuous lighthouse. The emphasis was on lighting, which together with power generation was the principal market for gas, with the incandescent burner as the latest novelty. The International Gas Congress held at the same time discussed these themes together with the use of compressed gas for the propulsion of vehicles. Some of the subjects discussed are not yet out of date. The advantages and disadvantages of the producer gas generator separated from the retort bench and arranged to feed any one of the settings remains a question of current interest. As in our own days naphthalene was enemy No. 1 to the distribution engineer and the efforts of technicians were directed to the discovery of the most practicable means of coping with it. The end of the oil-sealed meter had not yet come and the discussion was confined to the relative merits of the water-sealed meter and the dry; water-sealed meters are no longer manufactured, but the same dispute continues with regard to the dry and the oil-sealed meter. Prizes were offered to inventors who should produce a new incandescent burner, who should put forward improvements in the manufacture and utilisation of gas, and who should perfect coke-burning appliances.

Two questions which did not figure on the agenda of the Congress of 1900, but which nevertheless were exercising the minds of the technicians of the period, were first the production of carburetted water gas and second the appearance on the market of alternative gaseous fuels of which acetylene caused some anxiety in gas circles, where it was not yet seen as the precursor of gases such as butane which to-day are welcomed as rendering

assistance in the supply of town gas. The Editor suggests that these returns to the records of the past, interesting in themselves, are generally instructive. Many present-day problems are not so new as we think and the systematic study of past records may sometimes save much time and repetition.

UNDERGROUND GASIFICATION

THE announcement of an experimental scheme for the underground gasification of coal in this country, details of which were published in the *Journal* of December 7, has been followed closely by news of two experiments of a similar nature by private enterprise companies in the United States. The Sinclair Coal Gas Company has spent some $30,000 in the last two years on a project which has obtained coal gas directly from the natural seams by a new method of underground electrical carbonisation. According to the November issue of the American journal *Coal Age*, high-voltage electricity suitably applied to an unmined seam has produced an oil-rich gas of 500 to 600 B.Th.U. heat value. Field tests, which followed laboratory investigations at the Missouri School of Mines, indicate that the method might be employed successfully on a commercial scale. For the tests, drill holes were driven from the surface into a 2½-ft. seam, iron pipes being inserted into the holes to act as electrodes. A series of pipes a few feet above ground is then connected with the electrodes. The gas, when generated, passes upwards through the electrodes and then into the pipes. Gasification of the coal is achieved by passing the high-voltage current, controlled by a water rheostat, through the electrodes into the seam under treatment. When the seam has become sufficiently hot to maintain combustion, the current is cut off and air or oxygen is pumped into the porous coked mass to facilitate further gasification. Moisture is removed as the gas passes through a water collector located where the electrodes converge into a single pipe. The gas then passes through a flow meter and a cooling tower before being utilised. The latest field tests have been designed to determine whether this 'electro-carbonisation' of coal *in situ* is economically sound.

The second experiment, according to the *American Gas Journal* of December, 1949, has also been in operation over the last two years under the joint direction of the Alabama Power Company and the United States Bureau of Mines. A portion of the 100-mill. ton Gorgas coal seam has been dedicated to the tests which have a twofold purpose—to obtain for the company a low cost energy, and to provide for the Government a groundwork for the synthesis production of gasoline against the day when crude oil reserves are exhausted. Gas with a heating content of 398 B.Th.U. has been seeping through the drainage holes bored in the seam, but the gas actually obtained in test withdrawals has been diluted and has averaged only 99 and 100 B.Th.U. Dr. M. F. Fies, manager of coal operations for the company, has reported that he and the Government are convinced of the feasibility of the experiment. If the process continues to show improvement, the company proposes to build a pipeline through which to carry the gas for use under one of the 18 boilers in its generating station at a distance of half a mile.

PROBLEMS IN STEEL

THE final figures for steel production in 1949 show that the industry has succeeded in surpassing the higher of the two targets set by the Government in the Economic Survey. Output of 15,552,900 tons is by far the highest annual production ever achieved by the industry, and is 676,000 tons more than in 1948 and 2,828,000 tons more than in 1947; it also exceeds any pre-war figure, and is actually 5,155,000 tons above 1938. Such an achievement provides additional ammunition for opponents of the industry's nationalisation, the main argument for which has been based on the alleged failure of the industry to achieve sufficient productive capacity. It confirms at the same time the rightness of the Government's decision, taken, it will be recalled, on the insistence of the Lords, to postpone operation of the Steel Bill until after the coming election. In the meantime there is an unfortunate hiatus. The concomitant of political uncertainty as to the industry's future has been the suspension of preparations of new schemes for the progressive improvement of both technical efficiency and productivity. The Steel Federation's article which gives the figures quoted above considers the new problems which the industry will have to face. Among these can be mentioned the effect of devaluation in increasing the cost of imported ores; the prospect of increased railway rates as a result of the Transport Commission's recent application; and increased competition from the steel industry in Western Europe where productive capacity is overtaking demand. This last difficulty is probably the most important. A report from the Steel Division of the United Nations Economic Commission for Europe has arrived at the conclusion that if current plans for European steel production are implemented there may not be a market for the 8 mill. tons of surplus steel which will be seeking outlets in 1953. The British steel industry is confident that it has advantages in superior technique and in quality of its products, but its leadership and direction in the immediate future obviously calls for greater care and skill. Where those qualities will be found is at present by no means certain.

HOUSES INTO FLATS

IN London and in all our large cities there are a multitude of spacious old houses too expensive to maintain as single dwellings, too good to pull down. They are being systematically converted by local authorities, divided into flats of convenient size, and in their final form, absorb the homeless and the overcrowded who constitute an ever-growing problem of modern society. The opportunity afforded to the gas and electricity industries by this type of conversion has long been recognised, and both fuel services have derived valuable business from this source. The subject—an intriguing one for the conscientious architect and builder—has accumulated its own peculiar literature, some of it painstaking and genuinely useful, some glib and idealistic. One of the most memorable of the publications which have been dedicated to the cause of conversion was *Houses into Flats*, a large and handsome volume published by Ascot Gas Water Heaters, Ltd., in mid-1947, in which a number of notable architects and experts on subjects related to building contributed to the detailed and valuable whole The part played by gas was, of course, firmly stressed. It is, therefore, of interest to note the publication of a brochure with a similar but expanded title—*Electricity Turns Old Houses into New Flats*—published by the Electrical Development Association. It comes, we suggest, rather late in the day, but its punch, though delayed, is a forceful one. Production is of an unusually high standard, the illustrations are beyond criticism, and its 20 pages contain a maximum of information and a minimum of 'blurb.' For conversion, it states, 'electricity possesses a number of special advantages, the most important being that all the services required in the modern home . . . can be provided efficiently and economically by one installation from one cable brought into the house.' On this the booklet builds its case, and on the face of it, it is a good case. With much of the information given we would not quibble; the gas industry has never questioned the superiority of electricity for certain domestic

purposes. But when this fuel is recommended for economical full-time space heating and water heating, it is time to look closely at the supporting evidence. Claims are made for low running costs (for example, two units per person per day for a constant hot water service) which are themselves open to doubt, and the booklet refrains from mentioning the high initial cost of such appliances as electric washing machines. How many tenants can afford to buy these appliances or pay a rent sufficiently high to recoup the landlord? These are obvious points; a careful examination of the text and illustrations will reveal others. It cannot be denied, however, that this is a publication to be reckoned with, and it behoves everyone in the industry whose work is connected, directly or indirectly, with this question of house conversion not only to obtain a copy (from E.D.A. or any local electricity centre), but to have his answers ready.

Personal

Mr. **W. A. Waters,** Divisional Manager of the South Essex Division of the former Gas Light and Coke Company and latterly the North Thames Gas Board, has recently retired.

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Mr. **C. McCallum,** Rutherglen, Glasgow, has been appointed a member of the Scottish Gas Consultative Council. Councillor Mrs. **Margaret Larmour,** Grimsby, has been appointed a member of the East Midlands Gas Consultative Council.

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Mr. **John Neil,** burgh meter surveyor and collector for Lanark Town Council from 1920 until vesting day, was recently presented with a suitably inscribed electric clock by colleagues and staff, when he left the town chamberlain's office for new offices at the Lanark gasworks of the Scottish Gas Board.

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Mr. **C. K. F. Hague** has been appointed Deputy Chairman of Babcock and Wilcox, Ltd., in the place of Sir **Archibald McKinstry**, who has resigned that position, although he has intimated his willingness to serve on the Board. Mr. Hague will continue as Managing Director of the Company in addition to his new appointment.

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Mr. **H. S. Barnett,** formerly Chief Architect to the Gas Light and Coke Company, and later to the North Thames Gas Board, has been appointed Divisional Architect to the East Midland Division of the National Coal Board. Mr. Barnett will supervise the planning of new welfare premises, including pithead baths, in addition to his general work.

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Mr. **S. W. A. Wikner,** who has been Works Manager of the St. Anthony's By-Product Works, Newcastle-upon-Tyne, since 1919, retired on December 31. Presentations were made to Mr. Wikner by the officials and works staff, together with their good wishes for a long and happy retirement. Mr. **A. Pillans** has been appointed By-Products Manager in succession to Mr. Wikner.

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Mr. **C. J. Whittall,** Manager of the Mechanical Engineering Division of Elliott Brothers (London), Ltd., was appointed a Member of the Order of the British Empire in the New Year Honours List. Mr. Whittall, who has been with the Company for 36 years, spent several years in the electrical test room, from which he joined the naval and marine department, now the mechanical engineering division of which he is now in charge. During this time he has been closely associated with the development and production of naval gunnery equipment.

Councillor **S. Leitch,** Glasgow, a member of the Scottish Gas Consultative Council, has been appointed Deputy Chairman of the Council.

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Lord **de Lisle and Dudley** has been appointed a Director of the Cape Town and District Gas Light and Coke Company in the place of Mr. **C. W. Lilley,** who has resigned from the Board.

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Mr. **D. E. West,** M.INST.GAS E., M.INST.F., Engineer and General Manager of the Aberdare gas undertaking, has been appointed Engineer and General Manager of the Merthyr Tydfil and Dowlais undertakings. A native of Llanelly, Mr. West was a pupil at Llanelly County School, and afterwards at the Swansea and Cardiff Technical Colleges. Prior to his appointment in Aberdare, he was Engineer with the former Porthcawl gas department, and was also, at one time, Chief Technical Assistant with the Port Talbot gas department. He has served on the Court of Referees of the Ministry of Labour, Aberdare, and is also Secretary of Aberdare Rotary Club.

Obituary

Mr. **Henry James Woodfine**, who, until his retirement in 1948, was Managing Director and Secretary of the Wellington (Salop) Gas Company, died on January 12 at the age of 80. A native of Chester, Mr. Woodfine was trained at the Wallasey Corporation Gasworks. He was appointed Manager and Accountant of the Wellington Gas Company in 1905, and later became Managing Director and Secretary. During his 43 years' administration the sale of gas increased twentyfold. He was also a director of the Shrewsbury and Iron Bridge gas companies, and in 1931 he was President of the Midland Association of Gas Engineers and Managers. Mr. Woodfine, who was a widower, is survived by two sons and a daughter. His eldest son, Mr. C. H. Woodfine, is Engineer, Manager, and Secretary of the Wellington District, West Midlands Gas Board.

Letter to the Editor

SPARE PARTS

DEAR SIR.—As one of the many thousands who bought gas ovens in the 'thirties, I should like to know what is considered to be the normal life of a gas oven with careful use, and how long the makers of the oven should be able to supply necessary spare parts.

I have now had my oven, made by one of the chief makers, for about 15 years. It is in perfect condition except for one small part for which a spare is required. In August last I asked the local Sub-Division of the South Western Gas Board to obtain this part but up to the present I have not received it.

Two of the advertisements used regularly by the gas industry have been 'Gas never fails,' and 'Gas for service,' but here is a case of a customer being put to considerable trouble for want of a comparatively small spare part.

The other day I wrote to the sales manager of the firm concerned, who replied in a courteous but noncommittal letter containing the following paragraph:—

'You will appreciate that this cooker is of pre-war production, and not now being made. This means that the part which you require will have to be made specially and this is very difficult under present-day conditions.'

He gives no idea, however, whether the spare will be supplied.

Having spent most of my life abroad I do know that the difficulty in obtaining spare parts from some British firms drives trade away to certain foreign firms who give better service in this line.

Yours faithfully,

A. GUTHRIE.

9, Eldorado Crescent, Cheltenham.
January 12, 1950.

News in Brief

Preliminary Notice has been given of the annual general meeting of the Gas Engineers' National Guild, to be held in the lounge of the Town Hall, Bournemouth, on June 6, at 5.15 p.m. The date marks the opening day of the annual meeting of the Institution of Gas Engineers.

A Complete Survey of gas supplies to Border Scottish towns is being made to determine the needs of the south-eastern area as part of the long term development of services throughout Scotland. This will cover large and small undertakings and will be used as the basis for projected developments.

The £31,000 Claim by Hinckley (Leics.) Urban District Council against the West Midlands Gas Board relating to repayment of unappropriated profits of the undertaking for the financial year 1948-49 and April, 1949, has been rejected by the board. At a meeting of the Council on January 3 it was decided unanimously that proceedings should be instituted against the board in the High Court.

The Main Window Space of the Newport undertaking's showroom was occupied during the Christmas period by a large Christmas tree, for which the public and the undertaking's staff were invited to provide gifts. A fillip to the effort was provided by the Mayor of Newport (Councillor Mrs. M. J. Dunn), Mr. Hugh Gaitskell, Minister of Fuel and Power, Mr. T. Mervyn Jones, Chairman, Wales Gas Board, Mr. R. S. Snelling, Deputy Chairman, and five other board members, who provided gifts with autographed greetings cards. In all, 250 gifts comprising toys, books, and chocolates, eventually adorned the tree and surrounding floor space. These were distributed among the children of local hospitals in time for the Yuletide festivities.

A Record Send-out of more than 10 mill. cu.ft. of gas was achieved by the Fraserburgh undertaking last month. Output for December 31, at 436,000 cu.ft., was also the highest daily output ever recorded.

The Next Meeting of the Institute of Fuel will be held on February 7, at 5.30 p.m., at the Institution of Mechanical Engineers, Storey's Gate, London, S.W.1, when a paper will be presented on Scientific Control in the Coal Industry, by D. HICKS, M.SC., F.R.I.C., A.M.I.CHEM.E. (Member), Director of Scientific Control, National Coal Board.

The Scottish Gas Board has organised an exhibition in the Town Hall, Hawick, from January 17 to 21. The latest domestic gas appliances, and equipment for hotels and factory canteens, are on display, including installations soon to go into the canteens of two well-known local firms. The exhibition includes 'Mr. Therm's Puppet Show,' and cookery demonstrations are being held.

'Further Excellent Progress was recorded by the Directors of the Alliance and Dublin Consumers' Gas Company during the past year,' wrote the Financial Editor of *The Irish Independent* in his review of Irish investments for 1949. The market in the Company's ordinary stock, however, had made but slow response to the good results produced. The price of the shares touched a low level of 17s. 3d. in 1941, but since then had been as high as 26s. 4½d. compared with a present value of 25s. 1½d. The immediate outlook for the Company was good, and the continued growth of Dublin must find a reflection in the Company's revenue. Costs had undoubtedly increased tremendously, and there was no guarantee that they would not further increase, but the concern was very capably managed.

The North Thames Gas Board, the South Eastern Gas Board, and the Eastern Gas Board (Tottenham Division) co-operated at the recent Schoolboys' Own Exhibition in the Horticultural Halls, Westminster. Their stand dealt with tar, careers, gas utilisation in the shape of infra red tunnels, and had an hourly 'playlet' by the Stavordale marionettes, which was one of the highlights of the exhibition.

Gas Charges for street lighting at Middlesbrough have been adjusted by the Northern Gas Board at an extra cost to Middlesbrough Corporation of £662 per annum. The increase has been caused by the board's withdrawal of the concession for all gas used for public lighting over 365,000 therms per annum whereby gas charges are reduced from 6.2d. therm (less 10%) to 4.77d. per therm.

Coal Production last week showed a recovery from the low level of the holiday period. Total production at 3,724,000 tons was 23,000 tons higher than in the corresponding week last year. Manpower for the week ended December 31 was maintained at 708,900. Gas available at gasworks last week totalled 11,292.7 mill. cu.ft., against 10,468.1 mill. in the previous week, and 1,025.5 mill. units, against 848.9 mill., of electricity were sent out over the same period.

The Trade Statistics for November, 1949, just issued by the Central Statistics Office in the Republic of Ireland show imports of 20,337 tons of gas coal, valued at £93,636, as against 28,876 tons, valued at £133,666, in November, 1948. This brings the total of these imports for the first 11 months of 1949 to 227,604 tons, valued at £1,023,497, compared with 275,513 tons, valued at £1,223,960, for the corresponding period of 1948.

Diary

Jan. 19.—Midland Association of Gas Engineers and Managers: Continued discussion on paper on 'A Survey of the Liquor Disposal Problem,' by E. H. M. Badger, B.A., F.R.I.C., Chemist, North Thames Gas Board (presented at the Autumn Research Meeting of the Institution of Gas Engineers). Queen's Hotel, Birmingham, 2.30 p.m.

Jan. 19.—Southern Association of Gas Engineers and Managers (Western District): Paper by L. T. Minchin. Taunton Demonstration Room, 11.30 a.m.

Jan. 21.—Yorkshire Junior Gas Association: 'Present Day Distribution Problems,' J. Hoskin. Leeds.

Jan. 24.—Southern Association of Gas Engineers and Managers (Eastern District): 'Plant Improvements on a Medium Sized Gasworks,' H. W. Moys (North Thames Gas Board). Gas Industry House, 2.30 p.m.

Jan. 25.—Scottish Junior Gas Association (Western District): Afternoon Visit to Gartsherrie Ironworks and Coke Ovens, Bairds and Scottish Steel, Ltd., Coatbridge.

Jan. 25.—London and Southern Junior Gas Association: Visit to Lines Tri-ang Works, Morden.

Jan. 25-Feb. 3.—Hotel, Restaurant, and Catering Exhibition: Olympia (National Hall).

Jan. 26.—Midland Junior Gas Association: Visit to works of British Thomson-Houston, Ltd., Rugby.

Jan. 26.—North Thames Gas Consultative Council: St. Ermin's Hotel, Westminster, S.W.1, 2.30 p.m.

Feb. 3.—Scottish Junior Gas Association (Western District): 'Gas Conversions to Commercial Apparatus,' A. Walker (Motherwell); 'Difficulties in Handling Inferior Fuels,' G. W. Laing (Barrhead).

Feb. 10.—London and Southern Junior Gas Association: 'Heat and Water Vapour in Crude Gas,' F. E. Craddock (Research Laboratory, Fulham Works, North Thames Gas Board). Lecture Theatre, North Thames Gas Board, 178-180, Edgware Road, 7 p.m.

Feb. 11.—Midland Junior Gas Association: Dinner and Social Evening. Imperial Hotel, Temple Street, Birmingham, 6 p.m.

Feb. 13.—West Midlands Gas Consultative Council: Meeting, Birmingham, 2.30 p.m.

Feb. 14.—Scottish Junior Gas Association (Western District): Evening visit to Hoovers, Ltd., Cambuslang.

Feb. 14.—Midland Junior Gas Association: 'Civil Engineering Contracting for the Gas Industry,' W. H. G. Roach and R. Y. Stevens (Wm. Press and Son, Ltd.).

More Gas Stock Compensation Values

Publication on January 9 of the following list of gas valuations brings nearer the stage where all those securities capable of agreed settlement are within sight of a decision. The new list, which contains 85 stocks, including those of the South Eastern Gas Corporation, already announced, requires the issue of £5.6 mill. and raises the total issued for compensation purposes to £170.7 mill., plus £5.8 mill. for composite companies. The number of stocks whose value has now been assessed is 1,573, out of 1,951, plus 44 out of 62 stocks of composite companies. It is estimated that less than £10 mill. more will be needed to cover the 378 stocks yet to be valued. Securities shown below are in units of £100 unless otherwise noted.

Company	Compensation Value
Aspatria Ord. (£5 unit)	£8/6/8
Biggar Ord. (£1 unit)	28/–
Bognor 4½% Per. Deb.	£114
Do. 4½% Pref.	£110
Do. Consol. Ord. 'A'	£171
Do. Consol. Ord. 'B'	£194/10/–
Do. New Consol.	£160/10/–
Brightlingsea Ord. (£3 unit)	£8/10/–
Carluke Ord. (£1 unit)	65/–
Carmarthen 5% Deb.	£125
Do. 4% Deb.	£102/10/–
Do. 5% Non-Cum. Pref. (£25 unit)	£28/15/–
Do. Ord. (£25 unit)	£40
Do. New Ord. 1875 (£25 unit)	£37/10/–
Do. New Ord., 1886 (£25 unit)	£37/10/–
Castle-Douglas Ord. (1s. unit)	1/4½
Colyton 5% Deb. 1st Series	£100
Do. 5% Deb. 2nd Series	£100
Do. Pref. (£5 unit)	£3
Do. Ord. (£5 unit)	£3
Cupar 5% Pref. (£1 unit)	22/6
Do. Ord. (£30 unit)	£82/10/–
Dalbeattie Ord. (£5 unit)	£7
Dartmouth Ord. (£1 unit)	28/–
Dunmow Ord. (£1 unit)	29/–
Fakenham Ord. (£10 unit)	£8/14/–
Galashiels Ord. (£1 unit)	48/–
Grange and Cartmel Ord. (£1 unit)	24/6
Grantham 4% Red. Deb.	£102
Huntly Ord. (£1 unit)	52/–
Jedburgh Ord. £(1 unit)	28/6
Keith Ord. (£1 unit)	33/–
Keswick Orig. (£10 unit)	£20/10/–
Do. Orig. (£5 unit)	£10/5/–
Do. Addl. (£10 unit)	£14/10/–
Kettle Ord. (£1 10s. unit)	37/6
Kidderminster Consol. Ord.	£114
Lampeter, Llandyssil, Tregaron and Aberayron Ord. (£10 unit)	£13/10/–
Langholm Ord. (£1 unit)	15/–
Laurencekirk 'A' (£1 unit, 15s. paid)	20/–
Do. 'B' (£1 unit, 10s. paid)	20/–
Lochgelly 3% Red. Deb.	£100
Do. Ord. (£1 unit)	27/3
Market Weighton Ord. (£1 unit)	20/–
Markinch Ord. (£1 unit)	42/–
Martock 4½% Red. Deb.	£102/10/–
Do. 4½% Red. Deb. (£10 unit)	£10/5/–
Do. 4½% Pref. (£5 unit)	£5/7/6
Do. Ord. (£1 unit)	26/–
Melrose Ord. (£1 unit)	35/–
Moffat Gtd. 5% (£2 10s. unit)	£2/16/–
Do. Ord. (£10 unit)	£15
Newnham 4% Deb.	£102
Do. Ord. (£20 unit)	£25/4/–
Petersfield and Selsey 5% Irred. Deb.	£123/10/–
Do. 4% Irred. Deb.	£100
Do. 5½% Red. Deb.	£104
Do. 5% Pref. (£5 unit)	£2
Do. 6½% Red. Pref. (£5 unit)	£2/10/–
Do. Ord. (£5 unit)	10/–
St. Neots Orig. (£10 unit)	£22
Do. New (£10 unit)	£16
Sandbach Orig.	£207
Do. New	£150
South Eastern Gas Corporation 4% Irred. (Cum.) Pref.* (£1 unit)	20/7½
Do. 4½% Red. (Cum.) Pref.* (£1 unit)	22/8
Do. Ord.* (£1 unit)	28/3
Torpoint Ord. (£1 unit)	20/–
Tunbridge Wells 5½% Deb.	£135
Do. 4½% Deb.	£114
Do. 5% Max.	£111
Turriff Ord. (£1 unit)	35/–
Weymouth Ord.	£117/10/–
Wigton 4% Mort. Deb.	£100
Do. 4% 2nd Mort. Deb.	£100
Do. Ord. (£10 unit)	£6
Windsor 4% Perp. Deb.	£103
Do. 5% Pref. 'P' (£10 unit)	£11/10/–
Do. 5% Pref. 'P' (£8 unit)	£9/4/–
Do. Orig. 'O' (£20 unit)	£46
Do. New Ord. (£20 unit)	£32/8/–
Wirksworth Ord. (£10 unit)	£14/5/–
Worksop 5% Consol. Pref. 'A'	£115
Do. 5% Consol. Pref. 'B'	£115
Do. Consol. Ord.	£215

* The value of these quoted securities is the value for the purposes of Section 25 (2) of the Act as increased by direction of the Minister in accordance with Section 26 (1) of the Act.

Midland Tar Distillers

Presiding at the 27th annual meeting of the Midland Tar Distillers, Ltd., at Oldbury, on January 5, Mr. Stanley J. L. Robinson mentioned that since the last annual meeting the gas industry had been nationalised, and as a result their tar contracts were now vested in the various gas boards in whose areas they operated and they were responsible to them instead of, as previously, to approximately 160 separate gas undertakings. Crude tar distilled had risen still further. In the year under review the figure was 67,174,000 gal., compared with 61,500,000 gal. This, of course, was welcome, but it brought its difficulties in these days of prolonged delays in obtaining plant and equipment. The figure of 67 mill. gal. distilled was more than double the figure for the year to June 30, 1939. During practically the whole of the period from that date they had been labouring under war-time conditions, licences, permits, orders, regulations, &c., and endless delays in actually obtaining plant. They had had to distill an increasing intake of crude tar, and at the same time maintain the existing plant, erect new plant and keep pace with improvements and experience, and the work of their research and development departments.

All through the history of the company the receipts of crude tar had steadily risen, but in recent years at a rate out of all proportion to pre-war years. The uncertainties, however, such as shortage of gas coal and carbonising plant difficulties, the coke position and innumerable other factors, made it impossible for the producers of tar to estimate the future production with any long-term certainty. Although there might be a temporary falling off, the long-term view was far from unfavourable and they were going ahead with long-term plans. They were in negotiation for a site of approximately 90 acres in the Midland area where it was intended ultimately to concentrate refining activities, together with other developments. They had maintained their output of refined tar for road purposes, and many would have noted in the Midland counties the really excellent results obtained this year. The year had seen a serious falling off in the demand for tar acids, both at home and for export, particularly the U.S.A. Recently, indications of quite a definite revival were apparent. Exports of pitch and road tar to the Continent continued, but on a reduced scale and at lower prices. Creosote exports to the Continent and U.S.A. had been somewhat reduced, due to competition, including that of Germany, but the devaluation of the pound had so far been of material financial benefit.

Trade News

Further expansion by **Oldham and Son, Ltd.,** of their operations in South Africa is envisaged following greatly increased demand for the Company's products. Mr. John Oldham, O.B.E., J.P., Chairman of the Company, left for South Africa on January 5 for important discussions, and will be joined there by the Company's financial adviser and the chief engineer. Meetings will take place with important coal, gold, and copper mining groups. Mr. Oldham is expected to return in March.

Mr. Sydney Barratt and Mr. W. E. Keith Piercy, of **Albright & Wilson, Ltd.,** Oldbury, nr. Birmingham, recently visited Calgon, Inc., in Pittsburgh, America, to discuss numerous problems. Albright & Wilson manufacture and market the water conditioner 'Calgon' for various uses—industrial, commercial and domestic—in Great Britain, Europe, and throughout most of the countries comprising the British Commonwealth of Nations. During their visit they discussed negotiations with D. J. Erikson, president of the Hagon Corporation, of which Calgon, Inc., is a subsidiary.

Simon-Carves, Ltd., have published in their 70th year as designers and builders of by-product coking plants an attractive brochure entitled *Modern Coke Ovens,* giving a brief record of the Company's more recent work. The publication contains some 25 photographs of plants, both completed and under construction, the quality of which leaves nothing to be desired, and which clearly illustrate the progress in detail design which has taken place in the short period under review. Major technical particulars are given for each plant, and an introduction to the brochure provides information on the work which is now in hand. Copies of the brochure are available from the Company at Cheadle Heath, Stockport.

The **Palladium Engineering Co., Ltd.,** Chittening Trading Estate, Avonmouth, Bristol, have published details of their new 'Planet' electric chain hoist blocks. The blocks are made in three sizes; the first two, weighing 75 lb. each, are capable of lifting 5 cwt. and 10 cwt. loads through 10 ft., with a 1 ft. 1 in. headroom at 20 ft. and 10 ft. per min. respectively. The third size has a weight of 90 lb. and a 10 ft. lift, and can lift 1 ton at 5 ft. per min. with a headroom of 1 ft. 6 in. The blocks are operated by an electric motor which is switched on by a drum type controller fitted on the blocks and worked by pendent chains. A clutch fitted to the motor drive pulley provides protection against overloads, and a mechanical brake is fitted to the blocks, which are of the single-hook suspension type.

Economies in the North Western Area

REORGANISATION of the gas industry in the North West under nationalisation has been effected without bringing in more than a very small number of individuals from outside the enterprises vested in the North Western Gas Board, Colonel **W. Moncrieff Carr,** O.E.B., T.D., Chairman of the Board, told members of the North Western Gas Consultative Council at a meeting in Manchester on January 12.

'Virtually the entire headquarters staff consists of administrators and technicians with an unrivalled experience of group management taken over by the board,' Colonel Carr said. 'This means that we have, in fact, not increased the administrative team, although we have increased their responsibilities and greatly improved the organisational efficiency of the whole machine.'

The board, he said, hoped to effect substantial economies in operating costs as a result of bulk buying, better coordination of managements and labour, and the application of the best technical brains to the problems of economic production. He thought it might be possible that these economies would offset an expected increase in the price of coal resulting from increased transport charges.

He explained that the board had plans for introducing the most modern types of gas and coke burning appliances on such easy terms that even the poorest families would be able to afford them. It was the hope of the board that within a few years not a single obsolete gas cooker would remain in use in the North West.

Clash with N.C.B.

A clash of views between the board and the National Coal Board over the price which the Coal Board was proposing to charge for bulk gas supplies from its coke ovens at Altham was mentioned by Colonel Carr. He stated that the price proposed would adversely affect the development of gas sales in Burnley, Accrington, Blackburn, Haslingden, and surrounding districts. Using the same basis of costing as in normal gasworks practice, the North Western Gas Board could build new coke ovens and produce the gas it needs at two-thirds the price the National Coal Board is asking, Colonel Carr stated. This is after meeting all capital and depreciation charges.

The Council appointed Chairmen and Deputy Chairmen of the four district committees. Some 310 letters have been circulated to local authorities, county councils, and other interested organisations representing industrial, commercial, and domestic consumers, inviting nominations to the district committees from which the nomination committee will make their selection.

The question of the joint reading of gas and electricity meters was considered, arising out of a letter from a consumer in the Stockport area. The Chairman of the Council, Councillor C. E. P. Stott, J.P., had referred the matter to the board, and he had received their observations.

The bulk of consumers are supplied through pre-payment meters and the board cannot agree that any saving of time or economy can be effected by such joint reading of meters. The board regard meter readers to be the nerve centre of the industry inasmuch as they meet the consumer in the home, and this personal contact is all to the good of the industry.

The board further state that meter readers could not serve two masters and that divided responsibility between the gas and electricity industries was not good policy. In addition to which the added cost of accountancy services would counterbalance any economy which might be regarded as having been made at the meter reading stage.

The Council was informed that the occurrence of the explosion at Brierfield was the subject of an enquiry which is now proceeding.

The Chairman of the board, Colonel Carr, submitted a copy of an appeal he had made to employees in the North Western area, in connection with the Prime Minister's nation-wide call for economy, which had been circulated throughout the area.

Wage Restraint

A conference of trade union executives, which met in the Central Hall, London, on January 12, decided by the narrow majority of 657,000 to support the General Council's proposals for wage stabilisation. On a card vote, the result was 4,263,000 for and 3,606,000 against. The full significance of the large opposition vote, representing almost 50% of the T.U.C. membership, will be appreciated when it is recalled that only two years ago at a similar conference a policy of restraint was approved by 5,421,000 votes to 2,032,000. As recently as last September the Bridlington congress voted in favour of the continuation of that policy with 6,485,000 votes for and only 1 mill. against. This new swing-over can only mean that the limit to the acceptance of voluntary wage restrictions by the whole mass of workers has been reached. The majority gained at last week's conference is so slight that it is bound to render any general wage standstill extremely improbable.

The General Council's plan suggested the suspension of all wage claims and sliding scale agreements, except for very lowly paid workers, until January 1, 1951, at least, unless the index of retail prices rose to 118 or fell to 106. Most of the leading unions with sliding scale agreements are believed to have voted against the General Council. Apart from these, most unions with workers in key industries also opposed the motion, including the engineering group, electrical workers, foundry workers, boilermakers, miners, and the National Union of Railwaymen. More than half the votes in favour came from the two general workers' unions, the Transport and General Workers' Union and the General and Municipal Workers' Union.

Despite its narrow majority, the General Council intends to pursue its policy. Mr. Vincent Tewson, the general secretary, said after the conference: 'There is an inherent loyalty in the movement, and I think that the response will be far greater than the size of the majority indicates.' He considered it significant that the unions which probably had in their ranks most of the lower paid workers had loyally accepted the policy. But he failed to point out that these unions did not take a ballot vote of the rank and file. Had they done so, then members might well have followed the example of the National Union of Mineworkers, who reversed a decision of their delegate conference.

Gas and Freight Costs

Reference was made in last week's *Journal* to a meeting on January 5 of the Transport Tribunal which is sitting in London as a consultative committee to hear an application by the Transport Commission for authority to increase railway and canal and dock dues by 16¼%. Mr. H. Royston Askew, who is representing the Gas Council at the Tribunal, intervened in the proceedings on January 12 to correct a statement he had made on January 5, that the gas industry might have to buy less coal, if freight charges rose, and divert coal from rail to seaborne transport. 'I have now been instructed,' he said, 'to say on behalf of the Gas Council that in their view it is very unlikely that coal would be diverted to seaborne carriage in the next year or two.'

Midland Association

The meeting of the Midland Association of Gas Engineers and Managers, to be held at Queen's Hotel, Birmingham, tomorrow (January 19), will be devoted entirely to a continuation of the discussion on the paper by Mr. E. H. M. Badger, on 'A Survey of the Liquor Disposal Problem,' presented at the Autumn Research Meeting of the Institution of Gas Engineers, in London, last November. It was originally intended that the agenda should also include the presentation and discussion of a paper by Mr. S. K. Hawthorn on 'Making the Best Use of Existing Plant and Providing Extensions with Maximum Economy,' but it was decided that each of the subjects was sufficiently important to justify the devotion of the time of a full meeting.

There will therefore be a further meeting of the Association at the Queen's Hotel, Birmingham, on February 16, to deal with Mr. Hawthorn's paper. Before the presentation of the paper, revised draft rules of the proposed Institution of Gas Engineers Midland District Section (incorporating the Midland Association of Gas Engineers and Managers) will be submitted.

The British Welding Research Association has issued a reprint in booklet form, price 1s. 6d., of an article on 'Heat Treatment of Welded Constructions in Mild Steel,' which recently appeared in *Welding Research*.

Focus on the Gas Salesmen's Circles

An Examination of Current Thought on the Service Side

IT was to be expected that nationalisation would have its effect on the nature of the topics discussed by the industry's technical associations, that papers presented at their meetings would reflect the needs of the day. Some prominence has been given to recent meetings of both senior and junior associations, whose interests have lately focussed on distribution and its attendant problems of integration, etc. There is, however, another body of men in the industry whose ideas and methods are undergoing an equally great change, but who, on the whole, are less fortunate and less informed. These men, the salesmen who complete the last link in the chain of gas service, have had for nearly 30 years their own structure of discussion groups, the Gas Salesmen's Circles. The past year has threatened to disrupt their original form and perhaps sever both the continuity of collected thought and the friendships that have blossomed with the years. Their struggles to gain the recognition of the gas boards which now control their destinies and the overall blessing of the Gas Council have been reported in these columns before. Now, eight months after vesting date, the mists have almost cleared, minds have been set at rest, and the 1949/50 session has settled down to business with fresh hope and confidence. The interesting point is—has the business itself changed? Have these Circles tailored their programmes to embrace the changing face of sales methods? What are they talking about? The following notes constitute a rough cross-section of recent meetings. This is not a complete list and is not intended to be, but it does for a moment cast the spotlight on a few outstanding items which serves to illumine both sides of the fence—the gas boards' outlook on the one hand and the salesmen's on the other.

A Statement of Policy

One of the most important tasks of area board chairmen is to acquaint the various sections of their staff with the board's policy and its effect on its servants. Such addresses are of necessity somewhat repetitive, but they should contain information of genuine and peculiar interest to each audience. A notable example was Mr. G. le B. Diamond's recent talk to the Midland District Salesmen's Circle, in which he spoke not only of his own responsibilities as Chairman of the West Midlands Gas Board, but of his hearers' responsibilities and the manner in which they would be expected to assist in carrying out the board's policy. The greater part of his address was concerned purely with the sales and service side, and Mr. Diamond was at pains to make clear his views on the necessity for unification and control. A selling campaign, he said, must be planned and co-ordinated or it would be useless. Such a campaign had not been conducted in the West Midlands or anywhere else since pre-war days, and Mr. Diamond explained how there should be three or four specialised selling campaigns during the course of the year, singling out the cooker, the wash boiler, the water heater and the refrigerator as the main items, each campaign running for three weeks to a month each. In this connection Mr. Diamond stressed the part played by the slot meter collector and the fitter, who by deprecating the board's publicity when in conversation with consumers, could nullify their every effort. The solution was to tell every employee of each change of policy or sales campaign. Referring to conditions of trading, Mr. Diamond said that the board had found 'an impossible state of affairs,' adjacent towns charging widely different prices. National uniformity of prices was desirable, and following the report of a special committee, a conference was held with executive officers of adjacent area boards, and a scheme would be put into practice which co-ordinated sale and the hire purchase prices with those of the East Midlands and Eastern Gas Boards.

New Deal for Showrooms

Mr. Diamond laid particular stress upon the wider field for promotion opened by nationalisation, but he added: 'You must remember that nationalisation does not mean increased pay for mediocre and indifferent men, but nationalisation does mean recognition of men who take the trouble to qualify themselves by education, training, and experience for the job in hand.

One result of the unified commercial policy would be a close examination of showrooms throughout the area, many of which were indifferent, and ultimately a uniform colour scheme and general smartening up. 'I do not like to see more than one or two appliances in a window at the same time,' continued Mr. Diamond. 'I do not like to see a showroom window with three or four cookers standing in a row without a background, often with miscellaneous items such as pokers and irons symetrically arranged around the base. Sometimes dead flies can be seen on the stallboard of such a display, and too often the linoleum looks dingy and even dirty. There followed a detailed account of how windows should be utilised which clearly showed that the speaker had definite and progressive ideas on the subject.

In view of this concentration on the necessity for adequate displays, the subject of a paper presented to the same Circle by its late Chairman, Mr. C. E. Williams, has added significance. 'The Design and Organisation of an Exhibition Stand' is self-explanatory, and the author loses no time in getting down to brass tacks. This is not one of those general, vague, and idealistic affairs which attempt this difficult and specialised subject. There is, however, a trace of the purest optimism: 'On the day before opening the exhibition hall looks as if it has suffered a minor earthquake, but by some extraordinary effort of all concerned the official opening always sees the exhibit spick and span and the salesman at the ready'! The paper deals with the choice of a suitable site, the type of appliances to be shown, insurance, constructional materials and their characteristics, and the psychology of the idle visitor; it will be published in the February issue of *Gas Service*.

Personality and Administration

Returning for a moment to the attitude of area board chairmen, mention should be made of Sir Andrew G. Clow's remarks to a recent meeting of the Scottish (Western District) Circle. His subject was 'Personality and Administration' and was clearly a plea for humanity, enthusiasm, and variety. Referring to the kind of mentality which nationalisation tended to produce, Sir Andrew said he thought the employee was more likely to resemble the civil servant than the business man, showing a tendency to approach a subject with intellect rather than heart. Business, however, helped to bring one into touch with human feelings—a fact understood in advertising, politics, and the Press. 'We are here,' he concluded, 'to serve the public, not the Scottish Gas Board . . . . and we must make the public feel that it is dealing not merely with a machine but with -something human which desires their help and friendship.'

Somewhat similar sentiments were expressed in a Brains Trust held by the Southern District (Sussex Area) Circle on December 2. One question was thought to be in the nature of a challenge and was therefore put to the whole meeting: 'If you were asked to state what you would consider to be the greatest single improvement that could be made on the selling side of the industry, apart from cheaper gas, what would your answer be?' Answers were many and varied, ranging from the abolition of purchase tax to the provision of sulphur-free gas, but Mr. H. B. Collins (Brighton), the Chairman of the Circle, had the last word. 'Success,' he said, 'is centred round people, not processes, and I feel that the right sort of people must be attracted to our section of the industry and rewarded on a scale comparable with other walks of life.' Managements should closely study the people under their control and, where suitable, allow them to develop their personality through increased responsibility. The industry would be judged by those who came in contact with the public.

No subject has attracted more attention in recent months than distribution, and its various aspects have provided food for a considerable number of papers of late. W. H. B. Porter, Distributing Engineer to the North Western Gas Board, has done distribution staffs

everywhere a service by compiling a careful and thought-provoking paper on 'The Economics of Distribution' (*Gas Service*, January, 1950). The presentation of this paper was a notable event in the programme of the North Western District Circle and encouraged a lengthy discussion. In brief, Mr. Porter's aim was to show the limited extent to which mains and service layouts can be modified to keep down distributing costs without impairing the technical efficiency of supply. The paper showed that these costs are greatly reduced by increasing gas sales per consumer, and the possibilities from this source are more than can be achieved by reducing the main and service lengths per house, or by the adoption of a single mains system. To illustrate his argument, the author considers the mains layout for a typical housing scheme and presents comparative costs for a dual mains scheme, a modified dual mains scheme, and a single mains scheme.

The Coke Campaign

Another subject attracting exceptional attention at the present time is coke and the means to further its popularity. Recent Circle papers have dealt with many facets of the problem. For example, G. B. Thom, Development Manager of the Eagle Range and Grate Co., Ltd., put forward the research worker's views to the Home Counties (Western Area) Circle, illustrating the work of the Solid Fuel Laboratories. The author admitted that the research and development work which he had described was costly, and that doubts were sometimes expressed whether it yielded commensurate advantages to the community. 'But here,' he remarked, 'we have a striking example of inestimable benefits which are at hand, namely, elimination of domestic smoke, greater economy in the use of fuel, greater comfort in the home. The problem of domestic smoke has been solved in its technical aspects, but, as is too often the case, we fall short in the application of the known remedies. Large-scale replacement of old inefficient fireplaces by modern appliances which burn solid smokeless fuel would make a notable contribution to the alleviation of the smoke nuisance.

The uses of coke also formed the subject of an address to the Western District Circle by O. H. W. Boonham, Sub-Divisional Production Engineer at Cheltenham, who spoke of the factors influencing the successful performance of a coke grate. The shape of the knee brick, the height of the bend of the fire, the width of the throat, the height of the canopy flue, and chimney draught —all these played their part in determining how efficient the installation would be. The ensuing discussion dealt with, among other things, the best method of labelling coke sizes. A Mr. Dyer, of Cheltenham, contended that the numbers 1, 2, 3, and 4 conveyed nothing to the consumer, who had to be told in a practical way such as: No. 1 is the size of an orange, No. 2 the size of an egg, &c. Replying, the author pointed out that it was not practical to standardise sizes nationally due to the different screening in use, but Mr. J. Gwillim, who is the Secretary of the Circle, insisted that the position could be improved by using such descriptions as 'largest coke, open fire coke, closed boiler coke, and very small coke.' The matter is not as trivial as it may appear; consumers really do find it difficult to grasp what size of fuel is intended by a glib-tongued merchant.

The Public's Ignorance

The problem of disposing of excessive coke stocks is now receiving the attention it deserved long ago. Of the urgency of the matter there can be no doubt, and Mr. G. A. Matthews, Deputy Chairman of the West Midlands Gas Board, stressed this point when addressing the Midlands District Circle. 'I am not yet convinced that there is not a very good market for domestic coke,' he said, 'and I feel that the average consumer in the country is not fully apprised of the possibilities of coke—how much they can get, what it is capable of doing—I do not think they know sufficient about it.'

Mr. Matthews also had somthing to say on the position of salesmen in the nationalised industry. 'I think,' he said, 'that the showrooms staff and our salesmen in general have got to be regarded as equal in status to the engineering and chemical staffs of the industry. It is through them that we look to the future. and I think efficient salesmanship is equally as important an art or craft as efficient engineering. It is on those men and women who come in daily contact with the consumer that the future of this industry rests. The success of nationalisation is not going to be judged by a committee or committees in London; the success of nationalisation is going to be judged by the housewife, and the standard which she will take is the efficiency of her appliances, the courtesy and efficiency with which the gas employees meet her, and the same applies to industrialists using industrial appliances. I feel confident that our long record of good service is going to continue under the new set-up, and that it is going to improve. I feel, quite frankly, as one who has gone through the industry from the very bottom, that there is a greater future for young men in the gas industry today than has ever been available to them in the history of the British gas industry. We must give every assistance to bodies such as this to get about, to meet each other, to take advantage of looking over works, to meet your opposite numbers in other towns, and also to provide facilities for adequate training for salesmanship. I think it is the duty of the Board to do that.'

Electrical Competition

The Circle meetings reported above all reveal a determination to meet current needs and to so mould programmes as to keep the emphasis on the changing face of sales methods. In general, however, salesmen must concern themselves with the basic elements of selling, which vary only in detail from time to time. Fires, water heaters, cookers and other appliances must still be sold, and there is always a new viewpoint on an old problem. S. C. Johnson, who is Distribution Superintendent of the Arundel and Littlehampton District of the Brighton undertaking, took a familiar topic as the theme of his recent paper to the Southern District (Sussex Area) Circle. 'Hot Water in the Small Household'—a subject which is an evergreen in Circle programmes—proved to be a paper embracing much original thought and sound common sense. The author's comments on the immersion heater, which he terms 'the most formidable weapon in the electrical armoury,' are of interest. Referring to its disadvantages, he states: 'At the usual domestic loading of 3 kW the recovery rate is in the region of only 10 gal. hourly raised through 100°F. While such recovery suffices for the needs of many households, it is often necessary to adopt a time-table for baths dependent on the output of the heater and on other hot water requirements. An ample reserve of storage would do much to offset this, but would, of course, increase stand-by fuel consumption. With hard water, the smallness and high temperature of the heating surface is liable to lead to rapid scale formation, with a consequent reduction in efficiency. Comparative running costs will be dependent on local tariffs but, allowing a gas water heater 75% efficiency and an electric heater 90% efficiency in transmission, electricity at 1d. a unit is competitive with gas at 2s. a therm, and *pro rata*.

Future Hopes

Dismissing the possibility of producing a gas immersion heater which would be flue-less, and with a necessarily small heat input, the author suggests that the solution lies not in imitating our competitors but in improving and adopting heaters based on principles which have been successful in the past. He advocates the wall-fixing circulator, the initial plus installation cost of which is generally much lower than any other form of gas water heater providing multipoint service. 'It is to be regretted,' he suggests, 'that the popular gas rate is only 30 cu.ft./hr., offering no advantage in performance over a 3 kW immersion heater.' If a flue must be provided, 'cannot our designers at least give us the selling point of quick recovery?' Designers, the author suggests, visualise the circulator burning continually night and day; this is seldom the case, nor is it with immersion heaters, although users of the latter frequently forget to switch off.

Later in the paper there is reference to the water heater of the future, envisaged by Mr. Johnson as an instantaneous multipoint with a thermostatically controlled outlet temperature and with a balanced flue. The paper also refers to the closely related subject of home laundry and the part played by gas. The author wishes, however, that wash boilers and machines fitted with duplex burners to render positive the turn of the tap from 'boil' to 'simmer.'

The papers referred to in this review were chosen with care, but they constitute only a fraction of the many excellent papers which have been read to Salesmen's Circles during recent months; a more comprehensive selection is, of course, published in *Gas Service*. It is felt, however, that some indication has been given of the types of subject discussed by our salesmen in their efforts to keep gas salesmanship and service at its traditionally high level.

MAINTENANCE OF VERTICAL RETORT PLANTS*

By A. F. COTTRELL, M.Inst.Gas E.,
The Woodall-Duckham Company

***EDITOR'S NOTE*:—The aftermath of war with its inevitable restrictions and shortages has left many plants which are being called upon to work beyond their normal capacity. Under these conditions it is obvious that a high standard of maintenance is necessary. In this paper the author indicates the points which should be watched by those immediately in charge of continuous vertical retorts.**

MORE than 80% of the total gas in Scotland is made in continuous vertical retorts, and I chose for my subject maintenance because it embraces work which is almost invariably in the hands of members of junior associations.

At one time maintenance was considered to be the prerogative of the fitters or engineers, but it goes further than that and much can be done by designers and plant operators to avoid sectional failures and thereby minimise the calls on the fitting shop staff.

It will not be disputed that first class maintenance is impossible without a high standard of cleanliness and lighting.

Dirt in a gasworks should be dealt with where it originates rather than after it has been deposited all over the retort house. The main sources are :—

1. The coaling plant.
2. The retort discharging points.
3. The producer charging and cleaning points.
4. The coke screens.

It is always advisable to arrange both the coke screening plant and coal handling plant outside the retort house. Coke screening is always a dusty process and coal handling can be likewise as considerable quantities of dust occur when wagons are tipped and the coal is crushed.

Producer charging and fire cleaning invariably cause dust, the latter operation being a particular offender on account of the flocculent nature of the ash. It is useful therefore to provide hoods over the producer doors and to connect them to a suction plant arranged to collect the dust in closed containers. It is undesirable to use a suction plant at the producer charging points as produced gas may be entrained which could cause explosions. Such a system works well, however, at the retort bottoms where coke discharging may give rise to dust, particularly where water quenching is not practised.

Dust extraction plants can be of the dry or the wet type and it is not proposed to asess their relative merits. It must be realised, however, that both types need looking after if they are to function correctly. In the first place the ducting should always be provided with safety devices to prevent damage in case of explosions which could occur if gas accumulated. Secondly, the dust itself is frequently wet and is likely to cause corrosion and blockage. Relief can be obtained from these possibilities by passing hot air through the system for a period of half an hour or so after each round of discharging.

An inlet point between the bottom castings is suitable for collecting this hot air, which should be fed into the end of the trunking remote from the fan. In its passage to the fan it dries out the adhering dust which passes forward and thereby reduces corrosion and prevents blockage. Needless to say all ducting should be free from sharp bends or tees and crosses which would encourage deposition, and handholes and removable covers should be provided at strategic points for inspection and cleaning. If bag type collectors are used the clips and bags themselves must be well looked after as the acid moisture causes disintegration.

Even with the best possible arrangements for extraction at the various sources there will always be a certain amount of dirt and dust going forward into the atmosphere and settling in the retort house, and this is best dealt with by using vacuum cleaning plant. Several firms market suitable equipment which usually consists of standpipes at various points to which lengths of flexible hose with brush or other heads can be fitted. Bayonet fastenings are employed for easy fixing and the whole system is connected to an extraction fan and collectors.

The fact that a dusty atmosphere is sometimes inevitable has a bearing on plant maintenance and indicates the need for all machinery to be protected by proper housing. There are still too many pumps and engines unprotected in retort houses. Houses for pumps and engines should be designed with a view to repairs and adequate access should always be provided. Good ventilation is also desirable to minimise condensation which would result in corrosion and, if ammoniacal liquor is being handled, leakage at pump glands, &c., will cause trouble with electrical insulation.

Lighting and Ventilation

Adequate lighting at all points is important. It has both a practical and a psychological value. From the practical point of view it reduces the possibility of accidents, shows up dusty and dirty corners, and ensures that faults and failures can be easily observed and corrected by workmen and staff. There are plenty of retort houses being used as depositories for scrap iron, litter, &c., and invariably this is bound up with inadequate lighting. Once such spots are established it is useless to expect good results and the keen engineer will soon realise that the only satisfactory cure is to light the house in such a way that there are no dark corners or blind spots.

As a general rule, the workmen appreciate good lighting and if this is not provided they feel the management is falling down in its job and that there is no incentive for them to do more than they need. Good ventilation of retort houses is also essential. Natural means are preferable to forced means and attention should therefore be paid to design to make sure that openings are of adequate area and are so placed that air movement is assured.

Coke Extraction

The satisfactory performance of continuous vertical retorts is largely dependent on regular working of the extractor gear, and it is well worth while studying this mechanism in detail.

The internal extractors are driven by oscillating bars which are themselves operated by steam engines or electric motors through a train of gears. The latter are generally very robust and as they revolve slowly they rarely need attention other than refilling the grease cups. The speed of extraction can be regulated in several ways and modern W-D settings achieve it by varying the distance between adjustable clamps bolted to the push bars. It is usual to accept this 'gap' as an indication of the rate of travel, but a word of warning is necessary, as variations in alignment, worn pins, and pawl slip can affect the actual 'drive.' Consequently speeds of extraction should be verified by timing the individual extractor wheels, by noting the quantity of coke discharged, and by watching carefully the coal intake as registered by the coal indicators.

The clamps on the push bars are so arranged that one half of the retorts are driven on the forward stroke and the other half on the reverse stroke, so that while one half are driving the remainder are idling. The bars have a definite and similar movement forwards and backwards and they move the internal extractor rollers when the fixed clamp on the bar engages the

* A Paper to the Scottish Junior Gas Association (Eastern District), 7 December, 1949.

rocker arm. This turns the extractor wheel and the extractor roller. The movement continues to the end of the driving stroke and when the reversal occurs the rocker arm is disengaged from the extractor wheel and it is returned to a position determined by the gap between the fixed and adjustable clamps while the wheel itself is held stationary by a counterbalanced pawl. If the clamps are close together the lost motion is small and the amount of extractor movement is considerable, but if, on the other hand, the clamps are set wide apart there is more lost motion and the extractor movement is small. The rocker arm is provided with a driving pawl and an idling or back-lash pawl—the one engaging to drive and the other engaging to prevent back run. They are carefully machined and radiused and grip the machined rim of the extractor wheel. It is important that both the pawls work freely at all times and that the wheel is so positioned on the shaft that correct central engagement is assured. Most extractor troubles are caused by tight pins which do not permit the pawls to drop easily into position or by improperly aligned wheels which cause binding or slipping of the pawls, and the remedy is either a little graphite on the pins or re-alignment of the wheels. The pawls should *always* drop freely on to the centre of the wheel rim. The use of an abrasive such as fireclay on the rim to ensure a good grip is strongly deprecated.

The pawls and the blocks in the rocker arms should be inspected frequently. The roller or block at the lower extremity of the rocker arm is mounted on a breaker pin which is secured at either end by a spring clip, and if it is to function properly the driving load must be applied centrally and not to one side by the fixed clamp on the push bar. If this is not happening the reason must be sought and corrected. As a rule it will be due to faulty alignment of the wheel, which is easily corrected by loosening the key and re-adjusting. If the trouble is general throughout one side of a bench it may be necessary to re-align the push bars by adjusting the wood packings on the buckstays.

The breaker pins are provided as a safety device against possible damage by overloading due to large hard coke on the extractor or to overfilling of the lower coke hopper with consequent churning or to mechanical faults.

The pins are made of cast iron grooved in such a manner that they shear when the load increases above a predetermined figure. If they are to be replaced, correct pins must be used. and before replacing them the cause of the breakage must always be ascertained.

The extractor roller itself consists of a series of stars fixed to the shaft in the form of a helix. They are of very robust construction and have a long trouble-free life ; nevertheless, foreign matter in the coal can break the stars so that occasional inspections are desirable.

Heavy hanger bars are provided to prevent unrestricted flow of coke over the extractors. They are of great importance with coke from some of the low swelling Scottish coals and, in view of a possible increase in the allocation of such coals, it may be advisable to fit an adjustable stop bar to control the gap between the hangers and the extractors.

Lubrication of the extractor shafts is not usually necessary, but if practised it should be by some form of pressure gun and nipple using high temperature grease. The use of open oil cups is unsatisfactory.

The extractor shaft glands are packed with a graphite-impregnated asbestos which should be changed as soon as it gets hard and causes stiffness in operation.

Bottom Ironwork

Bottom ironwork is necessarily somewhat bulky as, apart from acting as storage space for a considerable make of coke, it has to house the extractor and to incorporate the discharger. Consequently the many joints and wearing parts need periodic attention. It is vital to keep all this ironwork in good order, since air infiltration will affect the gas quality and carbonising results.

The quality and composition of the metal used in these castings are of paramount importance as it is necessary for them to withstand occasional hot coke, constant abrasion, and the corrosive action of internal quenching. Such diverse requirements are very difficult to combine in any one metal, but it is a rare thing today for castings to suffer from cracking. Replacement is usually necessitated by wear caused by the abrasive qualities of the coke, and is sometimes accentuated if the coke quenching water is allowed to become acidic.

It is usual to provide some form of internal liners which should be examined at frequent intervals and replaced as they wear. As a rule liners are better made up in small cast iron sections as damage is usually local and can then be remedied more economically.

Unfortunately it frequently happens that once such plates are inserted they receive no attention until they *and* the outer plates are holed. This, of course, still results in a longer life than would be the case without them, but the life of the outer plate could be lengthened to an almost unlimited extent with occasional internal inspections. Joints in bottom ironwork rarely require attention, but if they should fail they should preferably be remade under cold conditions. This work is possible, however, under hot conditions and in emergencies can be carried out satisfactorily from the inside during scurfing by caulking in asbestos string and a mastic jointing compound. This, of course, is a really hot job and protection must be provided from radiant heat by asbestos sheets or the like.

As stated above, cracking of plates is unusual, but it may occur if the ironwork is overheated due to blocked steaming nipples, leaking joints, unsealed dischargers, or improperly closed doors.

Any sign of overheating should have immediate attention, as prolonged red heat in addition to damaging the castings can cause serious deflection of the floor joists which support the structure. Damage of this nature will ultimately lead to movement of the retort brickwork.

The usual discharger is of extremely robust construction and as a rule wear in the W-D type is confined to the curved door and the sides of the top plate immediately above it. When new, these two plates have a very small clearance, but abrasion by passing coke and some corrosion eventually result in thinning of the curved door and wearing away of the side plates, thus permitting coke to pass into the water seals and interfere with the proper functioning of the door. A great deal of this can be overcome by fitting protection plates which can be adjusted from time to time. They prevent wear on the sides of the top section and thereby stop coke from getting into the seals. Routine inspections are necessary, however, to ensure that their position is adjusted before the damage occurs.

The door is operated by an external counterbalanced wheel or lever and is mounted on shafts carried in suitable housings. The glands are packed with plastic metallic packing and graphited jute and need attention from time to time if they are to remain tight. Although the water is never in contact with the coke some very small breeze and dust gets into the seals and must be scooped out daily if the door is to continue to operate properly.

The dischargers have a water seal which is maintained by constant operation of the sprays. If water is not used for quenching a special supply point may be necessary to make certain that the seal is never lost. As mentioned previously, the quality of the water has a bearing on the life of the plates and re-circulation is not recommended unless means are provided for neutralising the sulphuric acid which is likely to be present. Tests of the pH value are desirable. Effective quenching of coke is achieved by attention to the steam jets and the water sprays. The former possibly receive more attention as they have an immediate effect on the calorific value, but inspection of both items is necessary. Too much water may neutralise the effect of the steam by condensing it. Both sets of jets should be tested for blockages and to make sure that their size does not alter. This latter is not likely as special steel is used for the steam nozzles ; but nevertheless, a watchful eye should be kept for any opening out.

The water sprays work quite satisfactorily at low pressures and have a very long life but, if they are replaced, care must be taken to see that the larger section of the pear shaped

opening is at the top and that the water enters horizontally at the bottom.

Top Ironwork

Tightness of top ironwork is also important as air drawn in at faulty joints or elsewhere will reduce the calorific value and therefore the efficiency of steaming. It will also affect the thiocyanate content of the liquor. Any joints, rodding holes, hand holes, &c., at which gas is seen to issue at pressure periods should receive immediate attention; otherwise air will be drawn in at suction periods. Most of these leakages are of a minor character, but rather more extensive trouble can occur at the mouthpiece joints if proper precautions are neglected at scurfing periods. At such times great care is necessary to ensure that no high temperatures are developed in the region of the top ironwork as this can result in warped or cracked mouthpieces, or failure of the mouthpiece joint.

Frequent tests of the oxygen and nitrogen contents of the gas at the inlet to purifiers should be made to check conditions. A high nitrogen content with normal oxygen suggests trouble at the bottom while high oxygen *and* nitrogen indicates top leakage.

Hot gases from scurfing chimneys should always be deflected away from overhead hoppers to avoid the possibility of fires. For the same reason asbestos sheets should be placed between the coal valves and the hoppers at scurfing times.

The coal indicator gear is an important piece of equipment and plant engineers should make sure that it is always in good order. It consists of a housing containing an internal and external chain mounted on the top of the auxiliary hopper. The inner chain is fitted at its extremity with a weight which lies on top of the coal in the auxiliary hopper. As the coal enters the retort its level in the hopper is lowered. The weight follows the coal, and as it descends the outer or indicator chain ascends so that the coal movement can be observed at a glance. As regards maintenance it is better to remove the whole unit as soon as a retort goes off for scurfing as this prevents overheating of the inner chain and binding of the mechanism. Removal of modern units is very simple and during scurfing periods they should be examined, cleaned, freed, and graphited and made ready for another run. If it is necessary to replace a chain, care must be taken as regards length, as both chains must marry up so that the outer is just at the bottom of the hopper when the inner is at the top and vice versa. It is also important to ensure that the fastening of the weight to the chain is adequate.

All seal pot covers on the collecting main should be sealed in oil to prevent corrosion and to avoid pollution of the atmosphere by ammonia fumes, and for the same reason all liquor tanks should be provided with covers which should also be sealed.

Retort house governors should always be provided. If they are of the bell type, corrosion can be minimised by using oil as the sealing medium instead of water.

Liquor Circulation

Hot liquor circulation is practised in all modern plants. Sprays are provided in the gas offtake pipes as well as in the gas collecting mains and liquor at a temperature of approximately 60 to 70° C. is circulated at a pressure of 10 to 15 lb./sq.in. The process prevents accumulation of deposits in the gas offtake pipes and in the mains and also cools the gas. The circulating liquor and condensates pass from the mains to a tank where separation of tar and liquor takes place under hot conditions. The clean liquor passes into a suction compartment whence it is re-circulated, and the tar passes into a storage well.

Tar must be run off from the tank at predetermined intervals unless an automatic device is provided. Wherever intermittent running-off occurs, the flow of make-up liquor must be increased so that a supply to the pump is always available.

A weak liquor make-up is also necessary to make good any normal losses from the system and to prevent the ammonium chloride concentration of the circulating liquor from becoming unduly high.

The sprays are of such a design that they rarely require attention but the supply pipes should be felt by hand at frequent intervals to make certain that liquor is flowing. When offtake pipes are augered the sprays should be examined to see that they are passing liquor correctly and that the flow is not restricted by carbon deposits around the jet.

Liquor Disposal

The liquor from continuous vertical retorts invariably contains a greater percentage of higher tar acids than that from other forms of carbonising plant, and it is these constituents which make it more difficult to handle in the usual bacteria beds at the sewage works. This applies whether or not the liquor is discharged in the crude form or after the sulphate or concentration plant, although in the treated form there is less difficulty.

Very little sulphate is now made in gasworks and the majority of the larger concerns prefer to produce concentrated ammonia liquor for disposal to some central chemical works. Other undertakings, including the majority of the small works, carry out neither of these processes and dispose of their crude untreated liquor either into local water courses, into the sea or the town sewers. Evaporation on firebars of producers has been practised in some places, but is not recommended on account of the high rate of corrosion of the ironwork. On coke oven plants and intermittent vertical chamber plants, coke is sometimes quenched with dilute liquor and in isolated cases it has been used to quench continuous vertical retort coke.

Whether or not any treatment is provided in the gasworks, care is necessary in disposal as the toxic and de-oxidation properties and traces of tar may well kill fish in the rivers and valuable bacteria in the sewage works and result in difficulties with the local authorities or catchment boards.

As the phenols contribute an appreciable percentage of the O/A value it is obvious that considerable relief would be afforded to the sewage system if dephenolation were practised. This, however, is as yet unsuited to plants other than the larger ones, although investigations are always proceeding which may lead to the evolution of a process capable of installation on small works.

Until this time arrives it is desirable for everything to be done to make the liquor less unacceptable. The Institution of Gas Engineers Committee have put forward the following recommendations which should be considered and practised wherever possible :—

1. Tar and liquor should be separated as soon as possible under hot conditions. Long contact between tar and liquor results in absorption of some of the constituents of the tar by the liquor. The two liquids should always be stored separately.
2. Hot detarring is useful for the same purpose as it results in the earliest possible separation of practically all the tar.
3. Modern washing plant is preferable to tower scrubbers on account of the long time contact in the latter.
4. Air for revivification should be introduced under pressure at a point as near to the purifiers as possible. Earlier admission is inadvisable as it tends to increase the quantity of thiocyanate. For the same reason air infiltration at retort ironwork must be avoided.
5. Whenever possible, liquor should be distilled before disposal.

Producers

Practically all continuous vertical retort installations are provided with step grate producers, although there are still a few bar grates in existence and a start has been made with the installation of the mechanical type (where suitably graded fuels are available).

Step grates have a high thermal efficiency and are extremely simple so that their maintenance is not usually a very serious item. The following points, however, should have attention :—

Primary air slides on the doors should always move easily as under natural draught conditions they are the means of adjusting the producer gas supply to the settings and hence the combustion chamber temperatures. Easy working is essential for accurate control and graphite should be applied frequently.

The doors themselves must be tightly shut at all times other than fire cleaning periods. They are usually provided with rubber or asbestos jointing strips which should be brushed at every fire cleaning operation and should be renewed when wear or hardening occurs. Hinges and tightening gear should be graphited as necessary, but not greased.

Steam supplies are controlled by reducing valves and orifice plates or nozzles. The latter need to be proved clean at all times and the orifice sizes should be checked occasionally.

Many installations use venturi tubes for injecting the primary air as a steam/air mixture. The efficiency of such equipment is affected by the position of the steam jet relative to the throat. For greatest air input per unit of steam, the jet should be positioned just outside the mouth of the casting itself. If it is nearer the throat, the steam/air ratio increases and the capacity of the unit as an air injector decreases.

It is necessary to keep the steam jet clear and the whole assembly clean as dust from fire cleaning can settle in the tube itself and affect performance.

It is impossible to obtain constant flue temperatures if steam pressure to the venturis is unreliable. This is vitally important and reducing valves should be provided and looked after. On battery settings automatic controllers are valuable in maintaining a constant producer gas pressure. They do this by adjusting the steam to the venturis. Some installations are supplied with saturated air under pressure which may or may not be automatically controlled as regards quantity. It should, however, be carefully controlled thermostatically as the temperature of the blast is important in minimising clinker troubles. Internal producer ironwork should be inspected frequently. If water is used the flow should be constant. An intermittent water supply can result in damage to the water trough which becomes overheated when the flow of water stops or, if very slow, cracks when the flow is resumed or increased.

Insufficient water and/or steam results in overheating the drip plates at the bottom of the producer which will bend and become displaced. Such displacement permits live fuel to drop into the ash pan and be shovelled away unburnt with the ashes, thus increasing the quantity of coke used as fuel.

The grates are usually provided with side steam pipes having a series of perforated holes through which steam passes into the fires. These pipes need to be properly located and positioned so that the jets of steam are actually directed into the fires and from time to time they need renewing as the corrosive atmosphere causes them to disintegrate. Top steam pipes are also provided for use where the fuel is very small and the use of water might result in an impermeable layer of dust on the fire bars.

The brickwork, of course, suffers damage in the usual way by ash attack and slagging, but the proper maintenance of the side steam pipes will assist in keeping down this wear.

While it is necessary to use a certain amount of force to break up and remove the clinker, too vigorous action on the part of the firemen should be deprecated as it can cause damage to the brick piers supporting the arches and to the side walls.

Overheating of the arches and brickwork above the producer doors can be caused by omitting to breeze up the upper rows of drip plates. This practice is adopted to prevent short circuiting of air, all of which should be caused to pass into the bottom of the fire and upwards. Constant attention to this matter is therefore necessary.

Producer charging lids are usually circular and they are not likely to give much trouble unless the frames are overheated, which can happen when producers are put to work after being shut down. The hot flame which issues at the charging holes during the re-lighting period should be deflected from the flame itself whenever possible by using a dummy chimney of smaller diameter than the charging hole. If, however, warping of the frames does occur, it is desirable to avoid producer gas escaping into the atmosphere of the retort house either by sealing the lids with sand or by lighting the issuing gas by means of permanent gas jets until renewals or replacements can be made.

As a general rule producer gas flues are under slight pressure but this is not invariably the case and consequently all damper box covers should fit properly and all frames should be tightly cemented in position to prevent air infiltration which would cause local combustion and overheating. This precaution is still necessary when flues are under pressure as producer gas escaping into the atmosphere is dangerous.

Air infiltration can occur and cause damage to the flues if one producer in a battery is shut down carelessly. It is important under such conditions to make sure that all producer gas dampers in the cold producer are effectively shut and sealed.

Retorts

It is a strange thing that the retort bench itself, which may be said to be the king pin of the works, is very frequently given scant attention. Whereas machinery may be very carefully tended, the retort plant—presumably on account of its robustness—is often left to look after itself. Fortunately it does seem capable of doing this for long periods but neglect is inevitably reflected in a reduction of the overall life and throughput.

Maintenance of retorts may be said to start with selection of coals which unfortunately is no longer as simple as it used to be. Coals having low fusing ash should be avoided. As it happens Scottish coals on the whole give ash with exceptionally high fusion temperatures so that damage from this source is unlikely to occur. Scottish coals are also usually low in salt content, which is deleterious because it affects the firebrick. High sulphur is always undesirable as it results in concentrated acid vapours in the discharge gases which can affect chimney brickwork and waste gas ducting. Regular working, regular scurfing, and regular temperature taking are valuable aids to long retort life. It is not good practice to stop or stand retorts on account of limited holder capacity. Obviously this may be necessary at times, but on the whole it is practised more frequently than is desirable.

Retorts should be rodded each hour even if the coal travel is perfect and rods must always be entered vertically to prevent damage to the brickwork. An aid to cleanliness is the prevention of tar drips from the emerging rods, which should always be stood in trays.

A regular scurfing routine is extremely important. If retorts are allowed to work for unlimited periods without scurfing there is a likelihood of the carbon blistering and being dislodged so that it affects the coal travel. If this happens local overheating can occur and cause damage. Even on well maintained works scurfing is frequently left to an odd job man. The process is of sufficient importance to warrant putting it into the hands of a responsible technical official.

As regards procedure, temperature control inside the retort needs careful adjustment. As soon as the scurf begins to burn off there may be a material rise in temperature which can damage the retort ironwork as well as the brickwork. The admission of air should, therefore, be controlled very carefully.

Wherever possible, the air should be admitted at the top of the retort and be caused to pass downwards and up again by means of a hanging plate. This is preferable to using the retort bottom as the point of admission as over-cooling of the bottom brickwork can be caused in this way. As soon as the scurf is burnt off there will be a drop in the brickwork temperature which should be counteracted by a slight opening of the dampers. If the above procedure is followed, if tools for

scurf removal are disallowed and nothing is permitted to interfere with a regular scurfing programme, damage will be at a minimum.

Temperatures should be read at regular and frequent intervals, preferably daily and in the morning. If this routine is adopted damper alterations can be made early in the day and the results can be watched to see that any changes have not been overdone.

Present day retorts have a long belt of silica so that temperatures up to 1,360° C. can be carried constantly and can be increased to 1,390° C. without much fear of damage. Nevertheless, a long retort life is only achieved by avoiding excessive temperatures and as a general rule any temperatures above 1,360° C. should be checked.

In fireclay installations, nothing above 1,280° C. should be allowed and for safety an average of 1,260° C. is ample.

When taking temperatures, a modern optical pyrometer should be used and it should be tested against a standard lamp at intervals. The eye is not reliable. When it is being used for high temperatures the red glass screen should always be fixed in the eye-piece to avoid eye strain and because the instruments are calibrated with this glass screen in position.

It should always be remembered that local damage can be caused by high spot temperatures and it is necessary, therefore, to look for such spots when recording the temperatures.

Although hanging of charges is extremely unusual, an unexpected change of coal or blistered scurf can cause this to happen. If it does, temperatures must be checked to prevent any possibility of overheating the brickwork.

Spalling and/or leakage are the main causes of failure of silica settings and the most usual reason for shutting down for cold repairs. In general, spalling occurs in the upper silica and leakage in the lower silica.

In downward heated settings spalling is particularly local and invariably occurs near the top of the silica where the temperature is highest on the flue side and lowest on the retort face side. It was thought at one time that stresses set up across the bricks at this level by the high differential temperature were the cause of the trouble, but experience with upward heated settings indicates that this is not the sole cause, as spalling occurs in both systems, although it is less localised in the upward heated retorts.

The latest theory suggests that spalling is more likely to be attributable to penetration of carbon or scurf into the brick pores and joints and consequent flaking of the brick when scurf is burnt off.

METHANE AS A TOWN GAS ENRICHER

The following is our report of the discussion on the paper by Dr. F. J. Dent and Dr. D. Hebden, of the Gas Research Board, at the research meeting of the Institution of Gas Engineers on November 30. The full title of the paper (G.R.B. 51) is 'The Catalytic Synthesis of Methane as a Method of Enrichment in Town Gas Manufacture.' We also give the remarks of Dr. Dent in presenting the paper.

DR. F. J. DENT, in presenting the paper, said that it represented a further stage of investigations carried out by the Gas Research Board and at the Fuel Research Station, and could be regarded as a direct sequel to the 49th Report of the Joint Research Committee. That report described the laboratory work on the catalytic synthesis of methane from carbon monoxide and hydrogen, and indicated methods by which the main difficulties associated with the reaction could be overcome.

Those difficulties, which resulted mainly from the strong exothermicity of the reaction and the nature of the catalyst used, were (i) loss of catalyst activity by overheating, (ii) loss of catalyst activity by sulphur poisoning, and (iii) blockages caused by the deposition of carbon on the catalyst.

All those difficulties were quite severe when first encountered at the high space velocities necessary on gas production plant. A catalyst could be poisoned in a few hours if the synthesis gas contained, say, 1 grain of sulphur per 100 cu.ft. and, in a similar period, it could lose its activity as a result of being overheated. It could block with carbon in a matter of minutes if supplied directly with blue water gas.

The aim had been to get a trouble-free performance from the catalyst for periods of at least four months in a type of apparatus which would be suitable for the irregular working associated with gas production. Thus, it was thought that the difficulties needed attacking courageously with the intention of eliminating rather than of merely alleviating them. There must be no opportunity for the catalyst to be overheated. There must be no tendency for carbon monoxide to decompose and deposit carbon, while the sulphur in the synthesis gas must be reduced to quite negligible proportions.

For these reasons the most positive method of temperature control was favoured—namely, by the recirculation of the reacting gases over the catalyst. With that method, fresh synthesis gas was diluted with reaction products before it met the catalyst and then an earlier attainment of equilibrium placed a ceiling on gas temperatures above which they could not rise. Adjustment of the rate of gas recirculation fixed the temperature ceiling, and that could be chosen so that loss of catalyst activity by overheating became unnoticeable.

Control of the temperature also went far to eliminate carbon deposition and only with gases rich in carbon monoxide such as blue water gas did there remain any tendency for the carbon monoxide to decompose. With such gases, a secondary equilibrium came into play and needed controlling by the addition of steam. But then the system became immune from carbon deposition. As mentioned in the earlier report, steam enabled methane to be synthesised from carbon monoxide alone without so much as a blackening of the catalyst.

Removal of Sulphur Compounds

With regard to the removal of sulphur compounds from the gas prior to synthesis, if that were to be coal gas, the position was that none of the recognised methods of purification were adequate and there was an additional complication due to the presence of unsaturated hydrocarbons. Unless those were removed by, say, a partial liquefaction process, as had indeed been proposed, there was little possibility of carrying out synthesis economically with coal gas.

The work done had more direct application to the use of gases obtained by the gasification of coke in steam, and in that case, the possibilities of purification were quite different. All the sulphur compounds present were amenable to catalytic conversion at a relatively low temperature and the conversion catalysts used had shown no signs of deterioration during periods of more than 12 months. What difficulty there was lay in the absorption of the hydrogen sulphide produced from the organic compounds, the difficulty being to find an absorbent which would work efficiently on very low concentrations of hydrogen sulphide without the gases being cooled from the catalyst temperature. Systems were known which would give the desired degree of purity and they had, indeed, been used; but it was thought that by further work the performance at the present stage could be improved.

Experiments on the synthesis side were not delayed because of that, however, and semi-scale demonstrations had been continued of the control methods evolved in the laboratory. These demonstrations went quite smoothly and in one of them gas of 700 B.Th.U. per cu.ft. had been made at 20 atm. In a second, gas of 500 B.Th.U. was made at atmospheric pressure and in that case a further stage of synthesis again raised the calorific value to 700. Both experiments were maintained at

a space velocity of 2,000 for a period of four months or more, and that performance brought the cost of the synthesis catalyst per therm of final gas to an acceptable figure.

It was now felt that no further synthesis experiment was required before the design of a full scale unit—particularly because recirculation was a chemical method of control which was independent of the scale of operation.

Attention could be drawn to the significance of the high space velocity of 2,000 which had been used. It meant that the volume of the catalyst bed required on a 5 mill. per day unit was no more than 70 cu.ft., say, 4 ft. diameter and 6 ft. deep. Smaller than that it was hardly worth while going from the point of view of plant costs, construction being almost entirely in mild steel.

For Immediate Attention

That work on synthesis commenced as part of a comprehensive research programme on complete gasification with the widest possible aims. In methane synthesis there was a reaction which offered the possibility of increasing the calorific value and modifying the combustion characteristics of gases containing hydrogen and oxides of carbon and that, in itself, was ample reason for its inclusion in a long-term programme. In writing the paper, however, two possible applications had been selected which seemed worthy of immediate consideration, one being its use for enriching blue water gas as normally prepared, the other for enriching gas obtained by the gasification of coke breeze under pressure with oxygen and steam.

The applications of a process depended upon its characteristics relative to possible alternatives. The line of reasoning followed was, first, that any gasification process needed a supply of enriching hydrocarbons over and above that obtainable from the volatile matter of coal; and the sources available were taken to be oil decomposition, coal hydrogenation, and catalytic synthesis.

Of these, oil had its important uses, but, due to its being imported and to its relatively high cost per therm, it also had its limitations. Hydrogenation was a pressure process and could not be carried out with high temperature coke. Catalytic synthesis remained as the one process which used indigenous raw materials, which could be applied in processes of coke gasification, and which could be operated at both high and low pressure.

As an adjunct to a coke process, synthesis was brought into comparison with enrichment by means of oil. Here there were two important differences. On the one hand, as a result of the price of coke per therm being less than half the price of oil, the cost of raw materials with synthesis was considerably lower than when using oil. But, on the other hand, the yield of gas was not increased during enrichment by synthesis and, in consequence, the thermal output of final gas from a given generator would only be half that obtained when using oil. Capital charges per therm of gas were increased accordingly.

So far as combining synthesis with normal water gas production was concerned, those characteristics defined the use of synthesis quite simply. At times of peak load, when the prime considerations were output and capital charges, synthesis could not compete with oil; the saving in the cost of raw materials was more than counter-balanced by the increased capital charges. But at other times, when the full output was not required and the plant was being operated as a result of its availability or with regard to coal supplies and coke production, then synthesis provided a satisfactory method of enrichment. The capital charges of the gasification plant were not involved and the savings effected in the cost of raw materials were likely to be more than sufficient for the installation and operation of the synthesis plant. Thus, so far as water gas production was concerned, the proposal was to use synthesis as the normal method of enrichment, changing over to oil only when the demand for gas required it. Synthesis could therefore be regarded as a method of conserving a supply of oil for peak loads, should it become advisable to restrict the total amount used.

The advisability of developing pressure gasification in this country had been discussed for several years now, and the possible effect of the caking of coals and, to some extent, the cost of the oxygen required had been considered. In breeze, however, there was a non-caking fuel available, difficult to gasify at atmospheric pressure, but sufficiently low in price to pay for the oxygen required for pressure gasification. Its only disadvantage was that it would not give a high calorific value gas directly, but that could now be remedied by the adoption of synthesis.

The possibilities of using breeze appeared attractive for areas where it could be collected together in sufficiently large quantities. Unless there was a particularly good coke market it was likely to give a cheaper gas than carbonisation. The process would be far more flexible, not least because the output of the plant could at any time be doubled by changing from synthesis to oil enrichment; and even when using oil, the combustion characteristics of the gas would not be greatly different from those of coal gas.

Although not by intention, the fact remained that breeze was a prepared fuel made from high priced coal and the view was advanced that it should not be used for steam raising, and its use as produced fuel did no more than liberate an equivalent amount of coke. In comparison, the potentialities of its conversion to gas of high calorific value were surprising. It was estimated that the amount of breeze available in the country was sufficient to produce up to 20% of our present gas sales, and up to 40% if it could be used in conjunction with weakly caking coals as described in the paper—and that gas would be obtained without further demands on supplies of gas coal and without producing additional coke for sale.

With regard to further action of those two proposals, it was believed that the gas industry should erect a full scale synthesis unit in combination with a water gas plant if no more than to gain experience in every-day operation and to obtain more precise economic data.

Concerning the utilisation of breeze, there were unlikely to be any insuperable difficulties in its gasification. Nevertheless, it would be advisable to obtain operating data before going to the extent of installing an oxygen plant and the corresponding series of generators. It would be more feasible to erect a single full scale generator near to an existing oxygen plant if such an opportunity could be found. The Gas Research Board was, however, erecting a pilot generator during the coming year, primarily to study the gasification and hydrogenation of coal; but it should also enable some estimate to be obtained of the efficiency, throughput, and pressure required, when using breeze. It was also the intention to erect a small generator for experiments on the gasification of fuel in the fluidised state, and they might indicate possibilities for circumstances in which the units necessary for gasification with oxygen were inconveniently large.

The Question of Calorific Value

Mr. E. Crowther (Chairman, Northern Gas Board) said that a year or more previously he had been sufficiently venturesome to put before the Director and staff of the Gas Research Board some considerations, as they appeared to a practising engineer, upon the possibility at that time, and in the then state of knowledge, of employing the process there and then on a commercial scale. For reasons which appeared sufficient to the company he then served the project was not pursued.

He had been reflecting on what was really the incentive towards the development of a commercial process for the synthesis of methane, and it appeared to him that it derived from the fact that the calorific value of gas supplied during the early days of the industry was in the order of 550 B.Th.U. per cu.ft. As a result distribution systems and plant generally were planned on that basis.

Although today's technique had been developed upon a somewhat lower basis of calorific value, it seemed to be accepted as axiomatic that to go below 500 C.V. in the Metropolitan area and other areas of high density of consumption, or below about 450 C.V. in other parts of the country, would present insuperable difficulties in respect of thermal capacities of storage, distribution, and measuring equipment, as well, perhaps, as in respect of gas-consuming equipment.

There was perhaps a certain amount of evidence in support of such a view where the contrary process had taken place—that was to say, where natural gas had been available and had replaced manufactured gas. There the process had been to step up calorific values very considerably, and there was more than sufficient evidence to show that where that had happened distribution problems had disappeared or been postponed for a generation or more. That was very good evidence, perhaps, of wisdom in not seeking to go below the figures he had suggested. At the same time, and without minimising the magnitude of the task of modifying plant and equipment to suit a lower C.V. than the calorific values in common use, it did appear to him that a re-examination of the question should now be made—the question, that was to say, of the possibility of employing a calorific value such as would permit of a suffi-

cient proportion of normal blue water gas to be blended with coal gas as to absorb the greater part of the coke resulting from carbonisation. By such means the industry's demand for coal would be greatly reduced, without the necessity for the use of oil, and without the expenses inevitably associated with the synthetic process outlined in the paper, although, on the other hand, large sums might have to be expended on enlargement of mains, services, and meters.

A Proposal for the Gas Council

However that might be and whatever might be the result of such an examination, rightly or wrongly the process so ably outlined in the paper accepted the desirability, if not the absolute necessity, for the maintenance of accustomed calorific values, and it was clear that the work had reached a stage—with the possible exception of the purification process for the synthesis gas—beyond which no further progress could be made without the construction and operation of plant upon a small commercial scale, from which operating experience and reliable figures of cost could be obtained. If this was to be done—and in his view the value of the information which would result would justify it—it would appear that it must be regarded as a matter of interest to the industry as a whole, to be conducted upon a national basis.

It might be well, therefore, for the Gas Council to be approached with the suggestion that they should consider the incorporation of the development of the project into their general programme of research. The work might proceed by stages, the first being the purification (down to 0.002 grain of sulphur) of blue water gas from an existing plant at a rate of not less than 10,000 cu.ft. per hour. That, when successful, would be followed by the synthesis process proper on a similar scale.

In this connection it would be desirable to determine whether it was preferable financially to produce one volume at, say, 700 C.V. and blend with one volume of blue water gas, or to produce two volumes at 500 C.V. with approximately twice the cost of purification to face.

To his mind the figures given in Table 4 of the paper were unacceptable. It was misleading, he would suggest, to merge carbonising and water gas figures together in this manner because, first, in the synthetic figures some 10% additional carbonising plant with all its associated costs was called for to give the same combined output of gas. One was carbonising 53½ tons of coal per unit of time against 49.1 in the case of oil enrichment, and presumably that additional 10% of carbonising plant had to come from somewhere and had to be costed against something. The authors had said : 'Capital charges need not be considered, since the (water gas) plant has already been installed for the peak load capacity.' If that was so, the maximum amount of synthesised gas which could be made in it would be little more than one-half the quantity proposed in Table 4, because it would naturally be limited by the plant capacity under the heading 'Oil.' Moreover, since the synthesis plant must close down whenever peak load called for oil enrichment, the load factor upon the purification and catalysis plants would be relatively poor, and capital cost of these items would be correspondingly heavy per therm. But perhaps the main criticism he could bring against the figures was that if, on the other hand, the synthesis plant was to be used on base load, the important cost comparison was not against oil enrichment but against carbonisation and presented a very difficult picture indeed. It could not but follow that these costs should be entangled—the coal gas, as it were, from the remaining gas—and examined on a different basis. He felt sure a different picture would then emerge. Hence he considered that the Table should be omitted from any papers remitted to the Gas Council, because the figures were more liable to injure than to promote the case for a commercial development of the plant.

Dr. **J. G. King**, O.B.E. (Director, Gas Research Board), remarked that questions of economics and the resolution of problems associated with the operation of full-scale plant could be resolved satisfactorily only on a first, prototype, plant. It was for the industry—probably the Gas Council—to decide who would take the brave step necessary. The Gas Research Board would, of course, help to the best of their ability as a research department. The direction in which these technical applications should go had been indicated in the paper and had been further stated by Dr. Dent.

An important consideration in the proposals to enrich water gas by methane synthesis was that the combustion characteristics and the specific gravity of the gas were closer to those of average carbonisation coal gas than were those of carburetted water gas. Since the only fuel constituents were the simple gases, hydrogen and carbon monoxide and the simplest hydrocarbon methane, the strain on the flexibility of appliances using total gas would be less than with carbonisation gas and appreciably less than with carburetted water gas mixture. They would like to think that at some not too distant date they would be collaborating with technicians in the industry in the operation of a first full scale plant.

The Engineering Aspect

Mr. **H. S. Cheetham** (Humphreys and Glasgow, Ltd.) said that in the paper they were presented with the results of a long period of careful and well conducted research and the well considered views of the authors concerning the practical application of the methane synthesis process. It was now for the gas industry to weigh these results and views and decide whether or not there was a case for the construction of a commercial plant of which the actual engineering would not appear to present any great difficulty. Such a plant would provide the further information which it was, of course, impossible to obtain from laboratory scale working.

The authors suggested that increases in demand for gas would tend to emphasise limitations in gas production by carbonising methods. He was doubtful if the proposed dual process of gasification under pressure with methane synthesis but without the use of oil would be found to be more flexible. Although the present carbonising plants could not be used economically to carry peak loads, they did have a certain flexibility so far as the seasonal load was concerned, and the present practice of substituting blue water gas made in separate plant for some of that otherwise made by steaming in retorts had served to increase this flexibility in some cases. If, on the other hand, the authors, in referring to limitations by carbonising methods, had in view limitations in the choice of coal suitable for use in the present carbonising plants, then the new dual process might have considerable advantages.

Coke Production and Sale

On the question of coke production and sale, the tendency—doubtless inevitable—to carbonise inferior coals would tend to worsen the competitive position of coke with other domestic fuels. It should at the same time be noted that modern water gas plant would gasify these inferior cokes without recourse to manual labour and without difficulty in operation, thus providing gas which would, it was hoped, be bought by the consumer who would not purchase such inferior coke. The inferior coke produced would, of course, be accompanied by larger quantities of breeze.

The gasification of breeze was, of course, a matter with which many were concerned at the present time, and there was little doubt that the difficulties normally associated with the use of small sized fuel would be minimised when operating under pressure. The authors' suggestion that the saving resulting from the up-grading of breeze would offset the cost of the necessary oxygen was most interesting. It must be remembered, however, that in a high pressure generator there were limitations not yet overcome in connection with the provision of ash discharge mechanism, so much so that clinker formation in this type of generator could not be tolerated. Consequently, gasification conditions must be suitably adjusted to ensure that it was avoided.

Unfortunately, reliable results covering operation of Lurgi generators without regard for methane production were not available, but the indications were that permissible carbon gasification rates were not expected to show any important increase. If this was substituted, then the alternative of operating the proposed pressure generators under methane synthesising conditions would merit consideration.

In the operation of Lurgi generators it was preferred to use a fuel in which the proportion below 2 mm. in size was limited, and whether or not screening to remove some of the fines from breeze before changing into this type of generator would be necessary would doubtless depend upon the grading and quality and so on of the breeze which it was proposed to use. If it were necessary to screen the breeze, then some preliminary drying to avoid blinding of the screens would probably be essential.

His company had had considerable experience in the full scale continuous gasification of coke in oxygen and steam in low pressure generators of the type in general use in this country, and the factors governing rates of gasification under these conditions were well established. They had not so far had occasion to gasify under such conditions fuel of the size

proposed by the authors, but with suitable screening and removal of the blow—say, one-eighth inch material—it would appear that the rates of carbon gasification obtained would be of the same order as those achieved in conventional Lurgi generators operating under methane synthesising conditions. It must be noted that with the low pressure generators the limitations in regard to clinker formation and removal were greatly minimised.

Economics of Oil Usage

The authors pointed out, quite rightly, that there was a limit to the amount of water gas that could be made, unless one had recourse to the use of imported oil. The use of such oil, however, effected a vast economy in the use of caking coal, and it was of interest here to mention the figures he had quoted last year in Birmingham. On the basis of a comparison of the annual figures for the whole of the gas industry for 1938 and 1946 it was calculated that the use of 334,700 tons of gas oil in 1946 enabled the gas industry to gasify 665,000 tons of coke substituting 2,876,000 tons of caking coal. To the extent to which methane synthesis could be substituted for gas oil corresponding savings in caking coal would be effected thereby.

In regard to combustion characteristics, it was of much interest to note the substantial reduction in specific gravity of both of the 500 B.Th.U. gases produced by synthesis from B.W.G. and by synthesis after gasification at high pressure respectively as compared with C.W.G. of 500 B.Th.U. This was, of course, to the credit of synthesis. It was a fact, however, that whereas in the past the higher specific gravity of C.W.G. was regarded by some as a considerable disadvantage, the subsequent changes in design of appliances and so on, supplemented by compensating adjustment of calorific value at times of peak demand, were such that no appreciable difficulties appeared to be met in these days even, as in many cases, where very substantial quantities of B.W.G. or C.W.G. were included in the town gas.

It was hoped that as a result of further research the authors would succeed in their quest for a satisfactory catalyst based other than on nickel. The resultant simplification of the methane synthesis process by avoiding the necessity to ensure freedom from sulphur compounds would be of very great value.

It was far from his intention in what he had said to write down the merits of methane synthesis. He thought there might well be a case for the construction of a commercial installation, and in this connection one should not overlook, as the authors had indicated, the possible improvement in overall efficiency of the methane synthesis process which might result from the experiments in blast and steam preheating on the specially designed water gas plant which his own company had recently constructed for the Gas Research Board.

Need for Overhaul of Views

Dr. **H. Hollings** (Chairman, Gas Research Board) said that for some years he had had the privilege of seeing in progress quite a number of researches in connection with gasification and carbonisation projects, and the general view that he took was that the time had now come when they ought to have a thorough overhaul of what was the purpose and what the objective in a great many of these investigations. He would like this overhaul to take place before they went too far with discussions for new commercial development.

As Dr. Dent had indicated in his opening remarks, the series of researches under discussion had had, at various times, the very widest possible terms of reference. But was it not time now to face up to the implications of the nationalisation of the coal industry and the nationalisation of their own industry too? Again, was it not time to recognise that as a result of a war the prices of coal, coke, oil, plant, and labour had all changed fundamentally and probably for a very long time to come? It followed that points of view which might have been quite proper and sensible some years ago should be reviewed drastically today. Their problem as research workers was surely to see that they had the right objective at the right time. In the past there had been several objectives which had been put before them. Sometimes it had been to make less coke, or even to make no coke at all, and in discussions at meetings they had a good deal of emphasis laid upon the desirability of developing the industry along the lines of the all-gas house. Sometimes emphasis in research work of this kind had been upon the production of a coke having particular properties suitable for the domestic market. At other times—and he thought particularly at the present time—they bore in mind the desirability of replacing one type of coal by another as their raw material. That, he believed, might be very important for the future planning of their research work; but the plea he was making was that if that was the objective they should be quite clear which coal was to be replaced by which and in what areas changes were to take place. At other times there was greater emphasis upon the desirability of coal conservation and selection of a gas-making process with a higher thermal efficiency. He hoped there would soon be more emphasis upon the desirability of economies of that kind.

Again, in passing might he remind them that they had often discussed the desirability of using less oil or less labour or less ground-space. At other times the researches of the Gas Research Board had been considered from the point of view of the desirability of making gas under pressure, either for delivery into a long-distance gas transmission system or for delivery direct to gas turbines. In connection with the long-distance gas transmission one had heard at times suggestions that they ought to be prepared for the manufacture of much more gas at the pithead.

Time for Restatement

They should evolve a restatement of what was their purpose at the present time. It might be held that all the objectives which he had mentioned and, indeed, many others, were desirable, but if so, any research staff engaged upon this kind of work should have these matters arranged in some order of priority. There would be much confusion, he feared, if they pursued this research much further without some statement of that kind, and with it there should be some reference to the capital expenditure which might be permitted upon any new plants and on the permissible changes of calorific values and other properties.

Again, thinking of the planning which would surely have to take place, there should be imported into this programme some reference to the time factor. There should be a clearer picture of whether they were required to devote their attention to the short-term or to the long-term problems of the industry.

Another general question should be clear in their minds: whether they were to seek to improve conditions on the smaller or even the rural works of the country or whether they were to plan for future concentration of gas manufacture in large units. It was clear from what Dr. Dent had been saying as well that there would have to be consideration of the load factor which any new process would have to meet.

When some of these points had been cleared up, they would then review all the possible lines of attack. This would, of course, include the very new and exciting possibilities which Dr. Dent had been putting forward, but they should not overlook other and perhaps less spectacular lines of attack. For example, if the primary purpose was simply to replace one coal by another, then in his view there should be a re-examination of the whole question of blending different coals in the gas industry. He feared that in this connection they were slipping, at the present time, a little behind the coke oven industry. It might be, too, that if the purpose were clearly defined they would find that there were available some low pressure processes of complete gasification which would be worthy of re-examination in the light of all the circumstances today.

Finally, in the light of any such review they should examine very carefully all the implications of a change in the coal gas/water gas ratio.

Dr. **E. T. Wilkins** spoke of parallel investigation on the same subject carried out at the Fuel Research Station of the D.S.I.R. It might be appropriate to indicate briefly the way these two programmes fitted together. They had, of course, encountered the same fundamental difficulties which they had sought to overcome by methods different from those which formed the basis of the paper. For example, to prevent rapid poisoning of the catalyst by traces of sulphur in the process gas they had not attempted to achieve the very high degree of purification which was possible by the use of the copper-chromium catalyst. Instead, they had used the ordinary alkaline-iron oxide method of purification which, in their experiments, had given residual sulphur contents of about one-fiftieth grain or more per 100 cu.ft., with occasional periods up to about ¼ grain. These sulphur contents were thus 10 to 100 times the value referred to in the paper as being desirable.

The effects of this amount of sulphur on the methane

catalyst had been circumvented by increasing its nickel content and by an improved design of reaction vessel. A catalyst containing 50% nickel and 50% kieselguhr had an active life of about six months when operating at normal space velocities (2,000 vols./vol./hr.).

The other major problem was the effective removal of the heat of the reaction and the recovery of this large amount of energy in a usable form. In their experiments they had concentrated on a method of distributing the reaction over a large area of catalyst which was cooled by a surrounding water jacket which thus produced high pressure steam.

Advantages of Oil Carburetting

Mr. **A. T. Grisenthwaite** remarked that it was clear that methane synthesis, if it was to be employed, was not something that could easily be tackled on to an existing plant. It was a case for large-scale operation so that gasholders and purifiers, and so on, could be kept entirely separate from the blue water gas plant so as to prevent thiophene contamination upsetting the organic sulphur removal.

In the comparison between carburetted water gas and methane synthesis for gas dilution, he agreed that the comparison could be made in many ways, and Dr. Dent had chosen a fixed output of coke with a varying coal input. If he had maintained a fixed coal input and compared the same volume and C.V. of C.W.G. as for methane synthesis, he would have the same number of therms in the two cases and the differential in favour of methane synthesis would, he thought, be reduced to just under 1.3 per therm. With a somewhat higher oil efficiency in the C.W.G. plant which could be obtained with good oil the differential could be still further reduced. The output of coke with methane synthesis would, of course, be lower than with carburetted water gas, thus giving the advantage of control over the coke market.

He was very interested in Dr. Dent's suggestion as to the possible advantages of the gasification of coke breeze under pressure. Had Dr. Dent in mind carbonising the weakly caking coal in order to produce a more reactive coke for the pressure gasification?

Regarding the suggestion of carburetting high pressure gas with oil during peak load periods, could the author give his ideas on this subject? Carburetting a gas made by the continuous process was not quite so straightforward as carburetting in a cyclic carburetted water gas process where heat from the blow gases was available for cracking.

In the case of pressure oxygen gasification with an adjustment of the hydrogen to carbon monoxide ratio to, say, 3 : 1, since the gas produced by this process was likely to be fairly high in carbon dioxide he presumed the carbon dioxide washing would take place before synthesis. This would, of course, reduce to some extent the organic sulphur compounds, although this might not be sufficient to eliminate one stage of the organic sulphur removal.

Although, of course, oil had to be imported for the manufacture of carburetted water gas, which probably called for the expenditure of dollars, it must be remembered that the actual dollar expenditure after deducting Government duties, freight and distribution charges was very much less than the total cost of oil shown on Table 4.

The Practical Angle

Dr. **M. Barash** said that as scientists they must express their admiration for the beautiful piece of catalytic work that had been carried out. It ranked with the work of Sabatier. The second aspect—he was sorry to say—related to the practicability of carrying out this process. After all, to adopt the term used already, 'average engineers' had to look at the practical aspect of such a process and the economic possibilities. His quarrel with the authors was the statement that it would now seem that the construction of a full-scale plant was justified. That was very premature. One must take into consideration the fact that the attitude of the average engineer, at first sight, would be that he had produced so much water gas from four molecules and that water gas was four volumes —one volume of CO plus three of hydrogen, and now it was suggested that he should produce one volume of methane. It seemed a retrogressive step. If it was done in some very attractive financial way, then perhaps a number of other aspects could be excused, but an important matter that should sway one was the capital cost of plant, particularly as the output of the water gas plant was going to be considerably reduced or, in other words, the amount of gas made was going to be considerably less. Having gone into these comparative calculations it appeared to him that the extra cost was going to take all the gilt off the gingerbread. In fact, it might take the gingerbread as well.

There was an addition, too, that had not been mentioned in the discussion—the very high percentage of carbon dioxide produced with this methane gas—and after all they were not aerated water manufacturers or out to produce dried ice for the ice-cream machines. But there was 44% of carbon dioxide which had to be removed before the gas was available for use, and after it had been removed there was still something in the region of 11% or 12% of nitrogen, a considerable increase in inerts.

The Authors' Reply

In a written reply to the discussion the authors stated :—

Following the nationalisation of the industry, there is a natural desire to examine the basis of many activities more broadly than has been possible hitherto and, among those which attract and require consideration, research stands in the forefront. There is no doubt that a discussion of what should be the primary objectives of research would bring little but benefit and would be most welcome. It should give guidance while allowing the flexibility needed in investigation, but would require a periodic review in the light of discoveries and the change of circumstances.

In case, however, such general reflections have in any way unwittingly obscured the objectives of the present investigation, we would like to restate these as being, first, to make only the best use of gas oil and, secondly, to enable gasification processes to be responsible for a greater proportion of the base load. In the discussion, no one has questioned the importance of these aims and most of the speakers have agreed that the indications of the research at its present stage warrant a full scale trial to obtain the added information which it would give.

Mr. Crowther would clearly be of the opinion that any general discussion of research should give consideration to the implication of many of the Board's researches—namely, that the calorific value of town gas should not depart from its present range. As is well appreciated, this is a complicated question and involves most aspects of gas manufacture. Some, with confidence in a good coke market and conscious of the flexibility bestowed by using oil, hold the view that calorific values should be maintained; nevertheless, there is obvious logic in the belief that where a greater proportion of the coke is gasified in steam the declared calorific value should be lowered. The important aspects of decisions on these questions seem to be their ultimate effect on the development of the industry far more than their immediate effect in achieving fractional savings. We now have an opportunity to mould a national gas supply, an opportunity which might not readily recur. The trends of research should be duly noted.

After careful consideration, we find that we cannot accept Mr. Crowther's criticism of the economic estimates given in Table 4. We do not agree that costing methods are necessarily elaborate and we do not feel that they are yet sufficiently advanced to indicate to engineers the most economical method of maintaining gas supplies. Costing in relation to peak loads has recently been examined but, so far as we are aware, it is not customary to assess in detail the costs of gas production under the conditions with which we are now concerned—namely, when some of the coke produced by carbonisation is gasified in water gas plants because it cannot be sold. It is usually taken that the water gas costs about twice as much as coal gas, which clearly does not account for its manufacture in those circumstances.

In actual fact, when water gas production is just consuming the unsaleable coke, the true costs of both coal gas and water gas are the same, an equality which enables the true average value of the coke produced to be assessed. The relationship between this true average value and the selling price is determined by the expenditure incurred in gasifying coke and the average value is improved when synthesis is used for enrichment instead of a high priced raw material such as oil.

Rather than elaborate on these considerations we avoided them by calculating the total costs of the raw materials used in meeting given gas and coke demands. Then, only the price of that proportion of the coke actually sold is involved. It would be quite misleading to make a direct comparison between enrichment by synthesis and by oil, with a fictitious price for the different amounts of coke used. The same con-

siderations are involved in comparing the cost of synthesis directly with the cost of coal gas to which Mr. Crowther also refers.

Claims Justified

We are not convinced that enrichment by synthesis, under the conditions proposed, should be debited with any capital charges of carbonising or gasification plant. During the greater part of the year most works of appreciable size have some carbonising and gasification plant standing idle while using oil for enrichment. We maintain that, in those circumstances, synthesis can achieve the advantages claimed for it without any installation of additional carbonising plant.

Dr. King and other speakers discussed the possibility of using sulphur resistant catalysts in order to avoid the necessity for the fine purification of the synthesis gas. Our experiments with such catalysts had two indications which appeared to be fundamentally significant. First, they showed that, with a so-called sulphur resistant catalyst, the mechanism of synthesis depended upon the sulphur compounds themselves and, secondly, that a catalyst in equilibrium with sulphur compounds was less stable, thermally, than one which was not. As a result, reaction was inevitably slow and needed greater control of temperature, while the sulphur compounds themselves were converted to hydrogen sulphide. This hydrogen sulphide would require subsequent removal at a cost amounting to a considerable part of the cost of a prior removal of organic sulphur. As Dr. King said, the possibilities of sulphur resistant catalysts did not appear promising and it seemed better to remove the organic compounds so as to have the advantages of a many times greater rate of reaction during synthesis and a more robust catalyst.

It is believed that the difficulties of the gas purification required when using nickel catalysts can be exaggerated. After the considerable effort made in attempts to remove the organic sulphur from coal gas, there is a natural tendency to imagine that obtaining a purity of a few thousandths of a grain in any gas must be difficult. In writing the paper we were at pains to give the impression that this was not so with synthesis gas, but, apparently, we have not been entirely successful. We can only repeat that we do not regard purification as a serious problem, and that the high degree of purity mentioned may not be absolutely necessary. We used gas of this purity mainly because there is little difficulty in attaining it. Dr. Wilkins suggested the use of the Ruhrchemie system, but that, while being less effective, would be more expensive.

Mr. Cheetham indicated that an installation gasifying breeze, using oil for peak loads, would be no more flexible than a combination of carbonising and water gas plants. As far as gas output is concerned we agree, but, remembering that the breeze installation, like the carbonising plant, is primarily to take the base load, achieving the flexibility in one case requires the installation of complete water gas plants whereas, in the other, the addition of oil cracking chambers would suffice. It might be argued that the alternative could be a combination of carbonising and oil gas plants, but the use of oil gas is limited on account of unsatisfactory combustion characteristics.

Regarding the proposal to gasify breeze under pressure it has been pointed out to us by several people that the size of a unit using oxygen is inconveniently large. In making this proposal we had in mind the possible course of the industry's development and that some concentration of gas manufacture is generally accepted as desirable. We also considered the value of such an installation as giving experience in a new technique and opportunity for developing the direct gasification of coal. It can be stressed, however, that there should be no insuperable difficulty in devising suitable methods for the gasification of breeze in smaller units, without using oxygen. The main point we wish to make in this connection is that, as a result of the synthesis reaction being made available, the potentialities of breeze have been considerably enhanced, the dependence upon synthesis arising from the fact that gasification of breeze would be essentially for the base load.

Clinker formation will undoubtedly limit the output obtained from a high pressure generator with the usual type of ash discharge. Much will clearly depend upon the fusion temperature of the ash, and obtaining an indication of where the limitation lies is regarded as one of the most important aspects of the work to be done on the pilot generator. It can be mentioned that the limitation would be less pronounced in a fluidised process and would be absent in a slagging generator.

Allowance has been made for the power required for pumping and regenerating the water and it amounted to 25% of the total power used in carbon dioxide removal. The loss of gas during washing was taken as 2.7%, on a thermal basis. The heat requirements for the organic sulphur removal plant were calculated with the efficiency of heat interchangers at 50% and additional gas heating at 70%. We did not contemplate a preliminary carbonisation of the weakly-caking coal.

We cannot supply precise information on the method to be employed to crack oil in a high pressure plant. As yet we have done no experiments on the possibility. There are, however, certain points to be borne in mind. First, under pressure, hydrogenation of the oil would occur with the evolution of heat which would assist in maintaining the temperature of the cracking chambers. The maintenance of temperature could also be assisted by using the supply of oxygen available. In addition, and as distinct from working at atmospheric pressure, the oil would be decomposed under conditions in which methane is stable and the tendency would be for carbon to be gasified. Methane would be the major product of decomposition and there would be little formation of unsaturated compounds.

We hope that our earlier remarks have lessened Dr. Barash's doubts regarding the economics of synthesis and the advisability of erecting a full scale plant. We take exception, however, to his very loose argument concerning the volume contraction during the reaction. It reminds us of a similar argument employed some years ago which sought to prove that the blue water gas process must be grossly inefficient since more than half the carbon is lost in the blow gases—an argument which, when extended, gives the efficiency of a hydrogen plant as zero.

It is some years now since the selling of gas was changed from a volumetric to a thermal basis and thus, when calling attention to a fourfold volume contraction, Dr. Barash should at least mention that the calorific value is increased more than threefold in the process. He should also mention that only a portion of the gas is converted to methane. The loss of potential heat from the gas during synthesis is clearly stated in the paper. It is approximately 10% when enriching to 450 B.Th.U. per cu.ft., not 75% as Dr. Barash would imply. The 10% loss can be converted into a considerable gain by using oil but, per therm, the cost of oil is 2.5 times the cost of coke.

The paper also takes full account of the removal of carbon dioxide. The fact that this is produced in high concentration cannot affect the cost of removal since the volume of water to be pumped is the same whatever the percentage. We cannot imagine why Dr. Barash refers to the 'considerable increase in inerts' since, at a given calorific value, the gas produced with synthesis is of lower density (0.50) than that produced with oil (0.62).

SPHEROIDAL CAST IRON

The *Chemical Trade Journal* reports a new type of cast iron produced by addition of magnesium, whereby the graphite present assumes the form of spheroids. This new iron, developed after many years in the laboratories of the International Nickel Co. and its associates, has more than twice the strength of ordinary cast iron, is much tougher and can be bent or twisted, this last property being markedly enhanced by a short heat treatment.

It can be made readily and economically, and its use for improving the conventional grey iron castings and for the replacement of malleable cast iron, and even in some cases of steel and other alloys, is rapidly becoming established. It undoubtedly represents a major development in the iron founding field.

U.S. Patent Nos. 2,485,760 and 2,485,761, covering the new cast iron, have been granted recently to the International Nickel Co.; three British applications (Nos. 630,070, 630,093, and 630,099), in the name of the Mond Nickel Co., have been accepted by the British Patent Office. Already over 40 firms have been licensed to make the new iron in the U.S.A. Individual foundries, among them, have cast as much as 100 tons of the iron in one day, and individual castings requiring more than 20 tons of metal have been poured. On the other hand, up to 12,000 castings of one part have successfully been made with regular results.

Licences for the production of the new iron in Great Britain have been granted to the Sheepbridge Stokes Centrifugal Castings Co., Ltd., Chesterfield; Robert Taylor and Son (Ironfounders), Ltd., Larbert, Stirlingshire, Scotland; Lloyds (Burton), Ltd., Wellington Works, Burton-on-Trent; and W. A. Baker and Co., Ltd., Newport, Monmouthshire. Other U.K. licences will shortly be granted.